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#### FINAL ENVIRONMENTAL IMPACT STATEMENT

FOR THE PROPOSED NOAA WESTERN REGIONAL CENTER DEVELOPMENT, SAND POINT, SEATTLE, WASHINGTON

AN ADMINISTRATIVE ACTION

DRAFT STATEMENT PUBLISHED ON JANUARY 31, 1975; COMMENTS WERE RECEIVED THROUGH MARCH 17, 1975.

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#### **FOREWORD**

This document has been produced according to the requirements of Section 102 of the National Environmental Policy Act (NEPA). Content requirements according to NEPA include:

- description of the action proposed
- purposes served by the action
- description of conditions likely to be affected by the proposed action
- environmental impact of the proposed action
- alternatives to the action
- relationship between local short-term uses and maintenance and enhancement of long-term productivity
- irreversible and irretrievable commitments of resources in the event the project is implemented
- considerations which offset possible adverse environmental effects.

Guidelines for environmental impact statements are set by the Council on Environmental Quality (CEQ), the agency which administers NEPA. CEQ instructions state that the detail of environmental impact statements should be commensurate with the extent and expected impact of the proposed action, and with the amount of information available at the level of decision-making on which the environmental impact statement is based. The guidelines stress the importance of using a systematic, interdisciplinary approach to the impact investigations reported in an environmental impact statement. An integrated use of the natural and social sciences and the environmental design arts is suggested.

In developing this statement, NOAA has used the basepoint of a 1972 project feasibility study by the firm of Naramore, Bain, Brady and Johanson. Since the publication of the draft environmental impact statement (DEIS), NOAA commissioned a facility requirements study with the Ralph M. Parsons and John Graham firms, which was largely completed in August of 1975. It is the latter study on which personnel projections, space requirements, and project costs used in this document are based. Other consulting specialists in such fields as architecture, biology, noise, urban social dynamics, and economics have performed studies for this document. A year long aquatic biota study completed since the DEIS was published is utilized in this document. Consultants who supplied information are identified at the beginning of each section. Care has been taken to document conditions at Sand Point before the aviation facility was developed so that these conditions could be used as the reference standard for assessing impacts. Similar attention has been given the human environment of the Sand Point area. Sections have been included which deal with community noise, visual impacts, social conditions and economic circumstances so that the values and standards of the Sand Point community and the City of Seattle bear on NOAA plans and impact assessments.

In addition, NOAA staff persons have consulted with state, county and local government officials, officials of other federal agencies and with Seattle area citizens interested in the project. The consultations included discussions of the issues to be emphasized in the research and the writing of the DEIS and this document. Considerable time was devoted to reviewing rough drafts of the DEIS with the same parties in order to test the adequacy of the treatment of the topics in the statement. Shortly after publication of the DEIS, NOAA held a public meeting to receive comments and to answer questions on the DEIS and the NOAA Center Project. The comments received in the public meeting have been combined with the written comments on the DEIS and included in this document. Valuable assistance and insight was received from many sources during the preparation and review of the DEIS. Nevertheless, NOAA takes full responsibility for the content of the DEIS and this statement, while at the same time gratefully acknowledging the contributions of persons outside the NOAA organization.

The preparation of the DEIS and this statement have been directed by Robert L. Carnahan, NOAA Deputy Assistant Administrator for Administration. Research supervision and writing and editing of the documents were done by Robert R. Griffith. Captain Robert E. Williams contributed significant preliminary studies of the project impact to the DEIS. Layout and publication of both documents have been supervised by John Oakley of the NOAA publication design section. Patricia Erickson and James Goodlin provided valuable editorial and publication assistance in the development of both documents. Others who have helped with typing and preparation of the document include Joyce Calvert, Louise Johnson, Pat Sander, Ellen McCraney and Timi Ringstad.

Public discussion and debate on the future use of Sand Point property is well into six years duration. The NOAA DEIS and this final impact statement were not intended to resolve the public controversy, but to set out the facts of NOAA's alternatives and the expected impacts of a NOAA Center at Sand Point. The EIS development and review process has been the vehicle for an unusual degree of consultation and cooperative planning and goal setting. This process and its achievements represented in this document are of great value to NOAA as well as substantial fulfillment of the intent of the National Environmental Policy Act.

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Sand Point, Looking Southeast

#### SUMMARY

#### A. EXISTING SITE CONDITIONS

The 114-acre site is in the northwest portion of the 312-acre former Sand Point Naval Air Station. The property was conveyed to NOAA on December 19, 1974. About 3,400 feet of Lake Washington shoreline is involved, 600 feet of which is edged with concrete remaining from a former seaplane launching ramp. Approximately 70 percent of the site is paved with asphalt and concrete used as a part of the former Naval airfield. There are three large hangars, a former air facility control tower, and miscellaneous small structures involved. The site is flat in appearance, sloping gradually from the NOAA southern boundary to the shoreline. Vegetation on the site is unmaintained grasses and small volunteer shrubs and trees.

#### B. THE PROPOSED DEVELOPMENT

NOAA proposes to construct a Western Regional Center on the site which would consolidate nine components presently dispersed at seven sites in the Seattle area. New facilities such as a NOAA employee educational complex, cafeteria and auditorium, and a visitor center are included. The Center would involve an estimated 1704 personnel by 1981; approximately 450,000 square feet of building space is required. One and two story buildings are planned to be arranged in functional clusters. Provision would be made for landscaping and access compatibility with the proposed City of Seattle park to the south, the adjacent Navy Support Activity, and the surrounding residential neighborhoods.

Basic facilities on the site would include marine environmental research laboratories, administrative offices, shops, storage facilities, marine mammal research laboratories, a weather service forecast office, fishery product research laboratories, National Ocean Survey offices, and an instrument calibration facility. Four piers and a small boat basin are planned for mooring 12 fishery and oceanographic research vessels. 950 - 1050 parking spaces for employees and visitors would be required.

#### C. ENVIRONMENTAL IMPACTS

Adverse impacts are largely of a short-term nature and follow from site preparation, dredging and construction activities. Most of these impacts can be mitigated significantly. Most longer term impacts are substantively beneficial. In assessing impacts, the environ-

mental baseline used was not the present aviation facility, but the circumstance existing before the excavation, filling, paving, and military airport activities. A synopsis of the significant impacts is as follows:

#### 1. Short-Term Impacts

#### a. Natural Conditions

Water quality. Dredging and pier construction will create temporary, localized water turbidity.

Soil. Dredged material will be deposited, dried and utilized on the site as a part of site preparation. Most of the pavement will be either taken up and re-used as a part of landscaping, or covered over with soil. A 2-acre lagoon is contemplated on the eastern portion of the site, adding about 1,100 feet of shoreline; 1,300 feet of shoreline would be involved in the pier complex.

Vegetation and wildlife. Most of the present vegetation inward from the shoreline would be covered or disturbed during construction. Land birds and ground animals would be largely displaced during construction. Waterfowl are not likely to be significantly affected.

Aquatic biota. During dredging, revetment construction, pier construction and lagoon excavation, severe water turbidity is likely which will blight the immediate area biologically for two to three months. The dredging would remove or bury existing benthic organisms in and immediately adjacent to the dredge area. Mobile aquatic life would probably avoid the area until the water cleared.

Sonic quality. Construction noise will be above ambient levels but will not exceed 75-80dB.

Public utility resources. Some solid waste material which cannot be disposed of on-site will be disposed of at existing commercial disposal sites.

#### b. Social Conditions

No significant change.

#### c. Economic Conditions

Investment of approximately \$65 million of new funds in Seattle area over the period of construction.

#### d. Visual Conditions

Construction activities are generally considered to be visually unappealing.

#### e. Land Use Conditions

Almost total transformation of the NOAA

site is contemplated. In adjacent areas no changes are likely as a result of this project.

#### f. Transportation Conditions

Unusual traffic during construction may require short-term special traffic routing.

g. Historical and Archeological Resources

No such resources are known to exist on the site.

#### 2. Long-Term Impacts

#### a. Natural Conditions

Air quality. No existing standards would be violated.

Water quality. New facility effluent and surface water controls would be required. A full range of vessel effluent controls are planned. No adverse effects on water quality are likely under these conditions.

Soil. Site development and landscaping would sharply increase the natural productivity of the site. Extensive new vegetation would be introduced. About 567,000 square feet of the lake bottom would be affected in the removal of about 260,000 cubic yards of bottom material. A riprap revetment would be installed along 1,300 feet of shoreline in the pier area.

Vegetation and wildlife. A net increase of about 40 acres of vegetation would be achieved in the construction process. Local varieties of trees, shrubs and grasses would be introduced. A substantial portion of the present on-land wildlife of the site would be displaced or eliminated. Waterfowl are not likely to be affected.

Aquatic biota. Recently completed aquatic biota studies indicate a probable net decrease in the biomass of the pier area due to the loss of the shallow area in creating vessel morrage. The benthic community can be expected to regenerate slowly and would not be significantly affected by NOAA pier area operations. Some fishes will probably increase in population in the pier area. The biological productivity of the lake will be relatively unaffected by these changes.

Sonic quality. No significant long-term adverse impact is likely. Maintenance of present ambient noise ranges might be attributable to the NOAA Center in operation.

#### b. Social Conditions

Significant addition to existing recreational and educational resources would be achieved. No adverse impacts are likely.

#### c. Economic Conditions

In addition to productivity and efficiency gains for NOAA, there would be additional stimulus to marine and oceanographic research in the region at institutions such as Battelle Northwest and the University of Washington. An additional 500 new jobs in the next 25 years would be brought to the Seattle area. No adverse effects are likely.

#### d. Visual Conditions

The sharply increased visual appeal of the site would enhance considerably the attractiveness of the surrounding neighborhoods.

#### e. Land Use Conditions

A net reduction of about 40 acres of exis-

ting pavement. Many of the topographic features of the site before the construction of the aviation facility would be reestablished. Public access to the site would be reestablished. The pier complex could be considered adverse from an environmental standpoint. The proposed lagoon is substantial compensation.

#### f. Transportation Conditions

Project-generated vehicular traffic will have no adverse effect on the functioning of the street system, provided that project entrances are adequately designed and controlled by traffic signals. Passage of NOAA vessels through the Lake Washington Ship Canal will not adversely affect vehicular traffic crossing the draw bridges to a significant degree, so long as the transit of vessels at peak hours is avoided in accordance with NOAA policies.

#### g. Historical and Archeological Resources

No such resources are known to exist on the

#### D. ALTERNATIVES

Along with Sand Point, NOAA considered sites at Manchester, Lake Union, the Duwamish River, Piers 90-91 and at Fort Worden. Additional consideration was given to split siting of NOAA facilities. Sand Point proved to be attractive from the standpoint of adverse impact avoidance as well as of the highest utility for NOAA and the best site in terms of utility to cost.



NOAA Ship Oceanographer

#### PART I

## Introduction: NOAA Mission and Operations

#### A. BACKGROUND AND NA-TIONAL MISSION OF THE AGENCY

NOAA was created within the Department of Commerce in 1970, as a new agency for the purpose of consolidating various agencies and programs with closely related missions then assigned to the Departments of Army, Commerce, Interior, Navy, Transportation and the National Science Foundation. With this consolidation and new dimension of activity as an agency, NOAA's components became the nation's major resource to: 1. explore, map or chart the global oceans, their geological formations and geophysical forces, and their mineral and living resources; 2. extend our understanding of critical processes in the atmosphere, the oceans, and in space; 3. warn of impending environmental hazards, such as hurricanes. floods, tsunamis, and tornadoes; 4, monitor, predict and document the gradual and continual changes in climate, marine life distributions, tides and other processes on earth and in space, and 5. restore, maintain, enhance, conserve, and utilize-in a rational manner—the fishery resources of importance to the United States.

Recent national legislation also commits NOAA components to a long-term program of marine environmental assessments as well as to environmental monitoring of the recovery of the oceans' mineral and food resources.

## B. NOAA RESEARCH AND SCIENTIFIC SERVICE ACTIVITIES IN THE SEATTLE AREA

## 1. Northwest Administrative Service Office

- Provide procurement and contractual services for the Seattle area components
- Maintain equipment and property
- Provide personnel management, employee development, counseling and recruitment services
- Give financial management counseling to related agencies, process financial data and update organizational costs in report printouts
- Provide offices and assistance to the NOAA Office of the General Counsel so that the local field office can provide legal services for the component units.

#### 2. National Weather Service, Weather Service Forecast Office

- Provide Washington State weather forecasts and information, including severe weather warnings, special forecasts for forest fire control, crop frost protection and river forecasting
- Maintain and service electronic weather instruments in the Northwest Region
- Provide marine forecasts to assist commercial and recreational activity
- Provide Puget Sound area air pollution potential forecasts
- Give forecasts to 11 Washington State air terminals for nine air routes across the State, and maintain service offices at Seattle-Tacoma International Airport and the FAA Air Route Traffic Control Center at Auburn.

#### 3. Northwest Regional Office, National Marine Fisheries Service

- Maintain the Columbia Fisheries Program Office at Portland, Oregon which (1) plans, administers and evaluates the construction and maintenance of hatcheries, fish screens and fishways; (2) helps restore and enhance runs of fish affected by dam construction; (3) studies the economic feasibility of fish production, (4) maintains and protects fish habitats affected by projects requiring Federal permits, water development projects and comprehensive basin planning, and (5) on a National level, formulates functional designs and reviews plans for fish passage and fish protection facilities
- Conduct marketing programs to improve marketing practices, distribute educational material, support and manage programs publishing commercial fisheries statistical information and provide current regional fish marketing information
- Administer fisheries loan funds used by commercial fishing vessels and provide funds, on a cost-sharing basis, for projects researching and developing commercial fisheries resources
- Provide a fishing vessel mortgage insurance program
- Assist vessel owners in controversies with foreign countries under the Fisherman's Protective Act of 1967 and protect water and marine resources from foreign encroachment and enforce provisions of

international fishery agreements

 Administer a voluntary fish inspection program to improve quality and sanitary conditions in plants, grade fish products and approve fish package labels.

#### 4. Northwest Fisheries Center, National Marine Fisheries Service

- Administer parts of the Marine Mammal Protection Act of 1972 as it concerns whales, seals, sea-lions and porpoises
- Administer the Pribilof Islands Management Program which provides for the utilization and conservation of the North Pacific fur seal resource, according to the terms of the Interim Convention for the Conservation of North Pacific Fur Seals Make recommendations for the protection of aquatic resources
- Analyze effects of serious environmental damage caused by discharges of harmful effluents, thermal changes and dredging operations
- Provide information on condition of selected, multi-nationally exploited fisheries resources
- Help negotiate and monitor international fishery agreements for the Pacific Ocean
- Develop and evaluate systems for protection of fish from hazardous conditions.

#### Coastal Zone and Estuarine Studies Division, Northwest Fisheries Center, National Marine Fisheries Service

- Develop aquaculture technology to facilitate the management of salmon fishery resources of the coastal zone
- Determine the effects of dams and other development in the Columbia Basin on fishery resources, and develop systems for the protection of fish from these hazardous conditions.

## 6. Marine Mammal Laboratory Division, Northwest Fisheries Center, National Marine Fisheries Service

- Administer the Pribilof Islands program to research the North Pacific fur seal
- Conduct research on the North Pacific whale population
- Conduct research on marine mammals to insure that they will always be in adequate number to fulfill their ecological role and satisfy recreational, aesthetic and economic needs.

#### 7. Marine Fish and Shellfish Division, Northwest Fisheries Center, National Marine Fisheries Service

- Conduct research and provide information on the biology, ecology and utilization of marine resources
- Provide the technical information base necessary for management policy or negotiation, resource management, capital investments, rehabilitation of domestic fishing and policy on the effects of man on marine resources
- Assist the native population on the Pribilof Islands in developing self-government and a self-supporting community.

#### 8. Office of Scientific Publications, National Marine Fisheries Service

Collect and maintain manuscripts originating at various National Marine Fisheries Service installations throughout the country

Edit, publish and distribute scientific periodicals and other research reports and documents concerning marine life.

#### 9. Pacific Utilization Research Center, National Marine Fisheries Service

- Develop new fish product concepts and products from under-utilized fish species and new mechanical methods for preparation of minced fish flesh
- Investigate traditional resources for the improvement of fish products
- Develop nutritionally adequate low-cost fish foods through research in aquaculture
- Manage studies of the fundamental requirements of herbivores and carnivores raised in artifical marine environments
- Conduct biochemical and processing research on protein isolates and chemically modified or derived proteins for use as ingredients in manufactured foods

- Investigate nonfood plant and animal resources for biological active compounds
- Support and inspect fish product safety programs.

#### 10. Pacific Marine Environmental Laboratory, Environmental Research Laboratory

- Conduct basic and applied research to better understand the marine environmental processes at work in the Pacific Northwest
- Plan and conduct research on the environment in the estuarine system
- Investigate the environmental impact of deep ocean mining
- Study tsunami (submarine earthquakes)
- Study and investigate the interactions of the oceans and atmosphere
- Provide a better understanding of the ecology of Puget Sound through research and analyses.

#### 11. Marine Ecosystems Analysis, Environmental Research Laboratory

Research and evaluate the effects of waste water discharges and the impact of oil spillage in Puget Sound.

## 12. Pacific Marine Center, National Ocean Survey

- Develop and recommend ocean surveys and direct these programs
- Develop and recommend geodetic surveys and direct these programs
- Coordinate and evaluate ocean chart corrections and emergency navigational dangers
- Direct and evaluate tidal monitoring operations
- Research and disseminate charts for ship-

- ping lanes, harbors, bottom configurations and other marine information
- Prepare raw data material on the Northwest Region for air traffic control and pilot charts
- Provide technical guidance for operation and maintenance of oceanographic systems
- Maintain all NOAA shipboard electronic equipment
- Provide technical support for NOAA vessel operations
- Provide, organize and direct NOAA vessel repairs and modifications
- Process and review finished field work surveys using manual and electronic techniques.

## 13. Northwest Regional Calibration Center, National Ocean Survey

 Maintain the calibration center (one of three in the United States) which provides calibration services for oceanographic instrumentation to federal, state and municipal governments, academic and industrial interests, universities and research organizations.

## 14. Other NOAA activities in the Northwest

- National Sea Grant Program provided \$1.4 million in FY 1975 to the University of Washington for marine education, advisory services, and a wide variety of research projects including seafood technology and fisheries management, assessment, and development
- Coastal Zone Management Program which helps support the development of a comprehensive coastal zone program for Washington State, pursuant to the Coastal Zone Management Act of 1972. A grant to the State of Washington of \$500.000 for FY 1976 was provided.



NOAA Ship Fairweather

# NOAA Facility Circumstances and Alternatives

## A. NOAA NEW FACILITIES POLICY AND RATIONALE

Since the creation of NOAA as a component within the Department of Commerce, it has been NOAA policy that geographically separated NOAA activities would be collocated wherever feasible. A high priority application of this policy is in Seattle where the second largest group of NOAA components

in the Nation is located. Presently, NOAA activities are situated at seven separate locations, of which six are leased, and not one of which allows the expansion expected in the coming years. Table 1 identifies the components and their characteristics.

In 1971, when the decision was made to collocate NOAA facilities in Seattle, two considerations were given priority. First, it would be greatly beneficial to accomplishing

NOAA operational objectives if all personnel could be accommodated in a single facility in a strongly favorable research atmosphere; and secondly, there would be considerable operating cost savings accruing at a consolidated facility. It was expected that in collocating facilities there would be cost savings in the following activities:

Reduction of agency travel and vehicle use

TABLE 1. Present NOAA Components in the Seattle Area

ORGANIZATION NAME AND LOCATION	PERSONNEL FY 76	ESTIMATED BUDGET FY 76 (thousands)	PRESENT SPACE (SQ. FT.)	RENT FY 76
*Northwest Administrative Service Office 1700 Westlake Avenue North	61	\$1,111.5	12,345	\$151,885
National Marine Fisheries Service				
Northwest Fisheries Center 2725 Montlake Boulevard	79	751.2	84,200	0
*Coastal Zone and Estuarine Division 2725 Montlake Boulevard	40	980.3	14,840	8,400
*Marine Fish and Shellfish Division 2725 Montlake Boulevard	78	2,141.8	13,060	0
*Marine Mammals Division Naval Support Activity, Sand Point	37	582.4	8,348	19,600
*Pacific Utilization Research Center 2725 Montlake Boulevard	35	905.2	18,736	55,700
*Office of Scientific Publications 1107 N. E. 45th Street	12	480.0	3,225	28,019
*Northwest Regional Office 1700 Westlake Avenue North	44	2,362.3	15,385	77,033
*National Weather Service Forecast Office 1700 Westlake Avenue North	33	679.0	7,605	104,526
National Ocean Survey  *Pacific Marine Center  1801 Fairview East  Shore-based	80	15,926.5	35,160	371,020
Ship-based in Port  *Northwest Regional Calibration Center Bellevue, Washington	576 6	130.0	5,400	21,862
Environmental Research Laboratory				
*Pacific Marine Environmental Laboratory 3711 15th Avenue Northeast	78	5,500.0	9,585	42,800
*Marine Ecosystems Analysis 3711 15th Avenue Northeast	1	500.0	200	1,200
*Environmental Data Service 3711 15th Avenue Northeast	1	30.0	175	1,000
TOTAL	1,161	\$32,080.2	228,264	\$855,073*

<sup>\*</sup>To be collocated at Sand Point. \*\*Includes maintenance, operations and utilities.

- Reduction in records, files, and library duplications
- Reduction of local mailing costs
- Reduction of typing and clerical service requirements
- Reduction in duplication of specialized technical equipment
- Reduction in personnel time devoted to work coordination and task communication among various locations
- Reduction of lease and rent expenditures
- Prevention of further fragmentation and attendant costs.

#### B. ALTERNATIVES FOR NOAA AND THE SAND POINT SITE

#### 1. Site Alternatives for NOAA

#### a. Project Site Alternatives

Information for this section is drawn from studies for NOAA by Robert G. Albrecht, P.E.

During 1970 and 1971, NOAA officials conducted several reconnaissance visits to potential sites in the Puget Sound region. With assistance from local government officials, representatives of the State's congressional delegation, and regional Federal agency officials, the following prospective sites were identified: Sand Point, Manchester, Lake Union, Duwamish, Piers 90 and 91, and Fort Worden. The Fort Worden site was subsequently rejected because of its extreme distance from the Seattle metropolitan area and the emerging certainty of substantial development there by the State Parks and Recreation Commission. In October 1972, NOAA formally applied for a portion of Sand Point, indicating a strong

preference for this site over the remaining four choices.

Adverse environmental impacts of the construction and operation of the NOAA Center at one of the sites fall into two general classes. In the rural Manchester site, adverse impacts would be high (See Table 2). The natural environmental conditions, the social service and utility infra-structure, and housing stocks in that area are far from the capacity to accommodate easily the NOAA Center. Moreover, the likely development of a major portion of the Manchester site as a state park is of significant public value at a lesser overall environmental cost. In contrast, at the Sand Point, Lake Union, Duwamish and Piers 90 and 91 sites, adverse impacts would be relatively slight since the already urbanized context in which they are situated would accommodate the NOAA Center without extensive changes. Higher adverse impacts of a NOAA Center development and operation in the city appear in the peculiarly urban variables of economics, land use, and transportation conditions. An exception would be the short term adverse impact of pier construction which would be least at the Lake Union and Piers 90 and 91 sites where high amounts of dredging would not be required.

The NOAA Center would be a long term economic boom in terms of private income to the relatively undeveloped Manchester area, but it would displace some economically desirable activity at the urban sites. A NOAA Center at Piers 90 and 91 would prevent, in part, the utilization of the existing pier resource by deep draft marine commerce vessels. The Duwamish estuary is committed to commerce as well, though the

specific site studied is federally owned, and is in use as a storage and vehicle garage facility. At Lake Union, a NOAA Center would affect commercial ship yard activities and a concrete products facility. Commercial significance of the Sand Point site is a potential but only for recreation-based businesses such as marinas, airports, and racetracks.

Land use conditions at the urban sites reflect Seattle's historical orientation of commerce toward water navigation resources. In general, Lake Union, the Duwamish estuary, and Piers 90 and 91 are all land to water and water to land commercial transfer points. Sand Point and Lake Washington, in general, are further from Puget Sound, and have a low level of commercial land use despite the encouragement to commerce of the ship canal. Thus, a NOAA Center at Lake Union, Duwamish, and Piers 90 and 91 would be in conflict with the existing and future commercial land uses near the sites.

The NOAA Center requires convenient access for employees, official visitors and vendors. Transportation conditions in terms of vehicle access to the Center and the environmental consequences of this traffic become important. Among urban sites, Lake Union poses the most difficult traffic situation. Lake Union is banded with arterials, yet connections to freeways, to the University and to residential areas are cumbersome. Piers 90 and 91 are not convenient to freeways and residential areas, yet traffic congestion as a result of a NOAA development would probably not be especially noticeable. Similarly, the Duwamish area would probably absorb NOAA development

TABLE 2. Comparison of Adverse Environmental Impacts Among Site Alternatives for the NOAA Center

ENVIRONMENTAL PARAMETERS	SAND POINT	MANCHESTER	LAKE UNION	DUWAMISH	PIERS 90 & 9
Natural Conditions					
Air Quality	L	Н	L	L	L
Climate	NO	CHANGE	AT ANY	SITE	
Water Quality	NO	CHANGE	AT ANY	SITE	
Soil	NO	CHANGE	AT ANY	SITE	
Vegetation and Wildlife	L	Н	L	L	L
Aquatic Biota	M	M	L	L-M	L
Sonic Quality	L	Н	L	L	L
Public Utility Resources	L	Н	L	L	L
Social Conditions					
Residential Density and Population	L	Н	L	L	- L
Social Service Resources	L	Н	L	L	L
Economic Conditions	L	Н	L-M	M	Н
Visual Conditions	L	Н	M	L	L
Land Use Conditions	L	Н	M	L-M	M
Transportation Conditions	L	Н	M	L	L
Historical and Archeological Resources	NO	CHANGE	AT ANY	SITE	

<sup>\*</sup>Impacts would be strongly beneficial from the standpoint of new industry development. From the standpoint of public services costs of serving the NOAA Center, there would be a high adverse effect.

traffic without noticeable adverse effect. Among the four urban sites, the NOAA Center would probably involve the most traffic change at the Lake Union site with the Sand Point, Piers 90-91 and Duwamish areas causing relatively modest change.

As represented in Table 2, adverse environmental consequences of the development of the NOAA Center at each of the sites is of two scales. A relatively high degree of adverse impact at Manchester and much lower at the four urban sites. Moreover, the

adverse consequences of NOAA development among the urban sites are not markedly differentiated; a comparison of the impacts does not establish clearly one site as more compelling than another, from an environmental perspective. Thus, since the four urban sites are generally equal in terms of probably adverse impacts from a NOAA development, a more useful evaluation of the sites emerges from an examination of the effectiveness of each site in terms of NOAA's requirements.

#### b. Site Evaluations

As a test of the objectivity of selection of the Sand Point site and to update site information, NOAA commissioned a comparative site study. The sites studied are identified in Figure 1; individual site maps are in Exhibit A. Table 3 lists the site evaluation criteria and the effectiveness assessments developed in the site study. Each site was rated on a scale of one to ten for each criterion as shown in the upper

TABLE 3. Site Alternatives and Effectiveness Assessments

EFFECTIVENESS CRITERIA	SAND POINT		MANCHESTER		LAKE UNION	•	DUWAMISH		PIERS 90-91	
1. Proximity to Univ. of Wash. (Travel times from U.W.)	10 minutes	9	120 minutes	4	10 minutes	9	30 minutes	7	30 minutes	7
2. Site Features (Physical attributes of the site)	PRO Flat; no fill; easy drainage; land stability CON Remove runways; poor bearin soil; piling required; high de- gree of landscaping required; dredging required;	ng	PRO No demolition; good bearin soil; excellent landscaping potential CON Hilly topography; cut & fill needed; long piers required; scattered buildings required shoreline dredging		PRO Flat surface; fair existing piers CON Narrow land shape; bisecte site; tall buildings needed; pile foundations; pier spacinadequate; landscaping problem		PRO Flat surface; minimal dredging CON Pavement removed; piling r quired; poor drainage; soil s bility problem; landscaping problem	sta-	PRO Existing piers; flat surface; no foundation problems; no dredging CON Building demolition; extensive pier & pile repairs; asphalt removal; landscaping problem	
3, Moorage Space (3,000 linear feet of vessel moorage required)	PRO Space adequate; wind protection adequate; easy access from buildings to piers CON High demand shoreline		PRO Some wind protection CON Limited space for moorage; poor access from buildings piers		PRO Wind protection good CON Limited space; poor access from buildings to pier	6	PRO Wind protection good CON Limited space; poor access from buildings to piers	7	PRO Adequate space CON Piers too high; no wind protection; poor access from buildings to piers	7
4. Water Type (Fresh water is the most cost effective)	Fresh water	10	Salt water	7	Fresh water	10	Brackish water	8	Salt water	7
5. Spatial Characteristics (On-shore building space and topography)	Easy expansion; ample space	10		8	Split parcels; insufficient space	5	Poor expansion potential	9		8
6. Overall Environmental Amenity (Visual and sonic attributes of the site and vicinity)	Scenic views; desirable residential context		Rural atmosphere; attractive scenery	10	Freeway nearby; partial residential context; industrial atmosphere	6	Railroad and freeway ad- jacent; heavily industri- alized atmosphere	5	Railroad nearby; some scenic views; industrial atmosphere	5
7. Personnel Amenity (Resources available to employees making NOAA an attractive employer)	Housing and services readily available		Outdoor recreation oppor- tunities available; distant from commercial & cultura facilities; rural atmosphere	7 I	Easy access to largest variety of houses & services	10	Housing & commercial choices somewhat limited	8	Housing & services readily available	9
8. Housing (Housing choices for employees)	Little change from present employee circumstances	$\neg$	An expensive move required for nearly all employees	5	Little change from present employee circumstances	10	Some north end & east side employees would probably relocate	8	Little change from present employee circumstances	10
9. Transportation (Public transportation & private vehicle access availability)	Bus service, public service & facility services reasonably available	$\neg$	Public transportation service difficult; facility services difficult	5	Same as Sand Point	9	Railways, freeways, Duwamish river & distance from center of city are handicaps	8	Same as Sand Point	9
10. Utilities Availability (Water, sewage, storm drainage and electrical energy resources)	Previous Navy use estab- lished utility system re- sources which could be used if some adjustments are made		All utilities would have to be brought to the site	5	Adjustments & extensive upgrading required	7	Same as Lake Union	7	Same as Lake Union	7
Facilities Services     (Fire protection, library, technical services, ship provisioning & ship repair & maintenance services)	Necessary services easily available		Services largely remote or absent from the vicinity of site	6	Same as Sand Point	10	Out of the usual pattern of needed services delivery	8	Somewhat out of the pattern of needed services delivery	9
12. Vessel Accessibility (Time & ease of vessel movement from Puget Sound)	Transit involves locks, four bridges & some contact with other waterway traffic	5	Minimum time; no obstruction	10	Transit involves locks, two bridges & contact with other waterway traffic	7	One bridge & other waterway traffic involved	8	Minimum: time; no 1 obstructions	10
13. Site Availability (Land cost & ease of land consolidation)	City favors NOAA use of the site; congressional legislation mandates NOAA use		State plans major park development on the site in the next biennium; small po tion used by State & Federa agencies		Except for present NOAA ship base, site is fully utilized by Navy Reserve, commercial activities & City of Seattle. Users would have to be relocated & land purchased.	1-	Most of the site near river is used by Federal agencies (including NOAA). Some private land purchase might be required.	8	Piers & backup space used by Port of Seattle. Port is negotiating acquisition of available portions.	7
14, Environmental Resource Utilization (Least adverse primary or secondary environmental impact & State & local policies & priorities regarding environmental quality.)	NOAA use would upgrade present circumstances & become a valued community & park feature. Minimum adverse effects.		Proposed park probably of more environmental value than NOAA use which is of an urban character. High acverse impact on surrounding community.	d-	NOAA development would upgrade the facility minimum adverse effect		Same as Lake Union	9	This site is best suited as a deepwater port; NOAA use would force such requirements to be met elsewhere, thereby encouraging development of port facilities in river estuaries. High adverse impact.	6

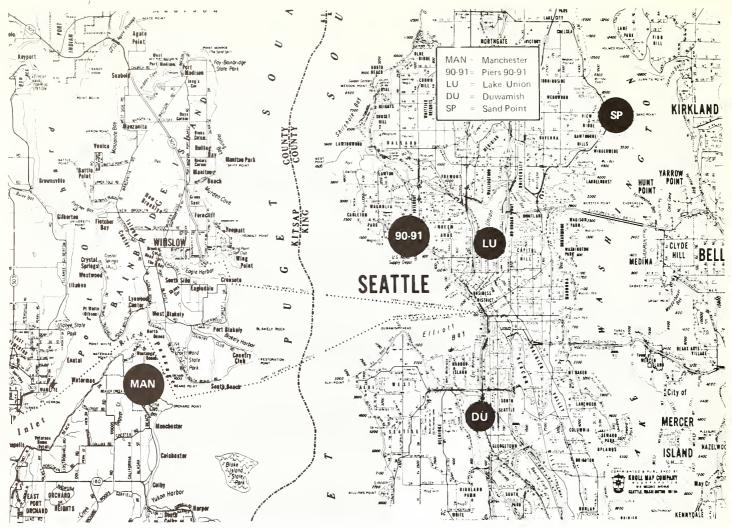


FIGURE 1. Site Alternatives for NOAA

right-hand corner of the assessment box in Table 3.

The study team then utilized a relative utility valuing system which expresses the relative value or importance that NOAA places on each effectiveness criterion. The utility values were determined by a system of paired comparisons in which the parts of each pair of criteria are valued against each other on a 10 point scale. Figure 2 illustrates this technique.

Table 4, expresses the paired comparisons in matrix format. As in the example, Figure 2, the horizontal sum of the numbers assigned to each criterion represent the aggregate importance or utility of the criterion. To improve the ease of interpretation of the results, the amounts have been proportionately reduced so their sum is 100, instead of 910. The last column in Table 4 contains the utility value for each criterion. The utility

<sup>&</sup>lt;sup>1</sup>Schimpeler, Charles G. and Greeco, William L., Systems Evaluation: An Approach Based on Community Structure and Value. Decision Making in Urban Planning, Robinson, Ira, Ed. Sage Publications, Beverly Hills, California, 1972, pp. 241-268.

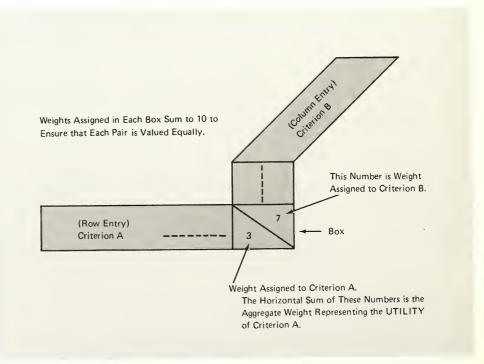


FIGURE 2. Illustration of the Paired Comparison Technique

TABLE 4. Paired Comparisons for Determining Utility Values

EFFECTIVENESS CRITERIA*	1. Institutional Proximity	2. Site Features	3. Moorage Space	4. Water Type	5. Spatial Characteristics	6. Environmental Amenity	7. Personnel Amenity	8. Housing	9. Transportation	10. Utilities Availability	11. Facility Services	12. Vessel Accessibility	3. Site Availability	14. Environmental Resource Utilization	SUM	UTILITY VALUES
1. Institutional Proximity		6	7 3	5	5	5	2 8	7	2	1 9	3	1 9	4	5	81	8.901
2. Site Features	6		5	6	7 3	4 6	5	7 3	2 8	1 9	7	2 8	4	7 3	75	8.242
3. Moorage Space	7 3	5		7	6	5	7	6	7	2	6	1 9	3 7	5	85	9.341
4. Water Type	5	4	7 3		2 8	6	8	9	5	7	2 8	10	3	5	81	8.901
5. Spatial Characteristics	5	7	6	2 8		5	7	8	7	10	6	10	4	5	88	9.670
6. Environmental Amenity	5	4	5	5	5		9	2 8	8	10	9	10	7	7	93	10.220
7. Personnel Amenity	2 8	5	3 7	8 2	7 3	1 9		6	4	7	7 3	7	5	8 2	50	5.495
8. Housing	3	7	6	9	2 8	2 8	4		5	6	7 3	6	7	9	43	4.725
9. Transportation	2 8	8	3	5	7	2 8	6	5 5		6	7 3	6	8 2	8 2	45	4.945
10. Utilities Availability	1 9	9	2 8	7 3	0	0	7 3	6	6		2 8	6	8	9	29	3.187
11. Facility Services	3	7 3	6	8 2	6	9	7	7	3 7	8 2		7	7 3	6	60	6.593
12. Vessel Accessibility	1 9	8 2	9	10 0	0	0	7 3	6	6	6	7 3		8 2	9	27	2.967
13. Site Availability	6	6	7 3	7 3	6	7 3	5	7	8	2	7	2 8		6	68	7.472
14. Environmental Resource Utilization	5 5	7	5	5	5	7 3	8 2	9	2	9	6	9	4		85	9.341
*See Table 3 for definitions of Effectiveness Criteria Totals						910	100.00									

TABLE 5. Comparative Site Development Costs

TYPE OF COST	SAND POINT	MANCHESTER	LAKE UNION	DUWAMISH	PIERS 90-91
Site Development	\$ 6,942,000	\$ 7,922,000	\$ 3,500,000	\$ 6,409,000	\$ 5,872,000
Utilities	898,000	1,286,000	1,078,000	1,078,000	1,168,000
Buildings	11,432,000	12,581,000	12,500,000	12,581,000	12,000,000
Internal Roads		390,000			
Renovation	180,000		200,000		200,000
Contractor OH & P	3,891,000	4,435,000	3,455,000	4,013,000	3,848,000
Contingency	583,000	665,000	518,000	602,000	577,000
Land Acquisition		250,000	2,600,000		
Phase II	2,992,000	2,992,000	3,590,000	2,992,000	2,992,000
Total Costs					
1972 Prices	\$ 26,924,000	\$ 30,521,000	\$ 24,841,000	\$ 27,675,000	\$ 26,657,000
1976 Prices	\$ 37,693,000	\$ 42,729,000	\$ 34,777,000	\$ 38,745,000	\$ 37,319,000

TABLE 6. Site Utility and Utility-to-Cost Ratio

	TOTAL	
SITE	UTILITY	UTILITY-TO-COST
	VALUE	RATIO
Sand Point	234.49	6.22
Manchester	184.72	4.32
Lake Union	196.71	5.66
Duwamish	192.33	4.96
Piers 90 and 91	191.73	5.14

value becomes, in effect, a multiplier in the overall effectiveness of a particular site rating. For example, NOAA values Site Environmental Amenity (10.220) and Environmental Resource Utilization (9.431) relatively high, while Vessel Accessibility (2.967) and Utilities Availability (3.187) are valued relatively low.

Relative development costs for each site were calculated (see Table 5). Estimates were based on a study conducted for NOAA in 1972 by the firm of Naramore, Bain, Brady and Johanson.

Total utility values were obtained by multiplying the utility values by the effectiveness value matrix. Finally the total utility values were divided by the relative site development costs to obtain the utility-to-cost ratios. A computer was used to perform all computations. The results are shown in Table 6.

The results show that the Sand Point site has the highest utility, and it is the most efficient in terms of utility to cost. As a test of the sensitivity of the results, the consultant conducted two additional tests In the first test, all effectiveness values were held constant while the utility values were modified to reflect a sharply more conservative estimate of the relative importance of each criterion (high weights were reduced; low weights were increased). In the second test, utility values were held constant and four key evaluation criteria were altered. Neither of these tests significantly changed the Total Utility or Utility-to-Cost Ratio ranking of the sites. In the Comparative Site Study, Sand Point proved to be superior to any other site alternative. The study concluded; "(1) In terms of total site utility, the Sand Point location exhibits the highest value-21% above the second highest; (2) In terms of utility-to-cost ratio, Sand Point represented the best alternative; (3) Sensitivity tests indicate that small variations in utility and effectiveness values do not substantially affect the site ranking results."

#### c. Split Site Alternatives

Consideration was given to the possibility of consolidating NOAA facilities on two sites, such as building new shore facilities at Sand Point and establishing ship berthing facilities

TABLE 7. Separate Moorage Site Utility and Utility to Cost Ratio

Vessel Moorage Alternative	TOTAL UTILITY VALUE	UTILITY TO COST RATIO		
Sand Point	603.3	100.55		
Lake Union	705.5	70.55		
Salmon Bay	743.4	67.58		
Duwamish	614.8	76.85		
Sand Point and Lake Union	601.1	66.79		
Sand Point and Salmon Bay	572.8	57.28		
Sand Point and Duwamish	465.4	51.71		

Source: Vessel Moorage Alternatives Study, Robert G. Albrecht, P.E. 1975.

at other locations on Lake Union, Salmon Bay (near Ballard) and in the Duwamish.<sup>2</sup> From the standpoint of vessel moorage and operation alone, a Salmon Bay site would be the most attractive, followed by Lake Union, Duwamish, and Sand Point. This finding follows from the fact that the closer the vessel base to Elliott Bay, the more attractive the site. See Table 7.

Separate moorage facilities would offer no particular environmental advantage from the standpoint of consequences of construction activity. Also of importance to NOAA, separating vessel moorage from shore-based facilities at Sand Point seriously erodes the operational effectiveness of the NOAA facility consolidation effort. Nearly half of NOAA's personnel are vessel-based or vessel related in work assignments. Close proximity of shore-based and ship-based employees is essential to the effectiveness of a consolidated NOAA Center.

In addition, consideration was given to splitting vessel moorage between Sand Point and other fresh water sites on Lake Union, Salmon Bay and Duwamish. This approach yielded no more attractive alternative, in terms of vessel operation utility, than separating all vessel moorage from shore-based facilities at Sand Point. See Table 7.

The study concluded that vessel moorage at a Salmon Bay site or a Lake Union site would have a higher utility than at Sand Point when considered only in terms of vessel moorage and vessel operation criteria. The Sand Point site offers a more attractive utility to cost ratio than any other site.

#### d. No-Project Alternative

Were the Sand Point site unavailable, NOAA would abandon the facility consolidation project and attempt to continue on a leased facility strategy. This alternative would restrict NOAA activities to limited additional leased space choices for accommodating anticipated growth. Additional new space to augment present facilities would expand the serious operational handicaps resulting from dispersed, inappropriate, and inadequate facilities.

#### 2. Alternative Uses of the Site

#### a. No-Action

The no-action alternative could occur if NOAA were to abandon plans for the development, or if federal funds for the planned development were withheld. The site would then remain unused and in its present condition as a part of the former Naval air facility. In the normal course of federal property management, the NOAA site would be declared excess and disposal to another user would take place. It is probably not in the public interest for such valuable urban public property to remain removed from appropriate public or private uses; moreover, there is little of natural environmental value which would compel preserving the existing condition of the site.

#### b. Natural Area and Wildlife Preserve

This use is probably the highest use from a purely environmental viewpoint. Many of the historical natural features of the site could be restored, with appropriate indigenous flora and fauna reestablished. There would be considerable public value in achieving large-scale natural rehabilitation of the site. This alternative is unlikely, however, for other use pressures nearly as environmentally meritorious would probably be of more public value in the urban residential context in which the site is situated. An additional handicap would be the extremely high capital cost to convert the site to a conservation and natural area from its present airport circumstance.

#### c. Park and Recreation Use

This use has been proposed in positions taken by City of Seattle officials for a number of years. The use has broad appeal as indicated by petitions and statements of community groups in recent years. City of Seattle officials have stated on numerous occasions that there is an unmet need for large amounts of park, recreation and open space in this quadrant of Seattle. The City of Seattle expects to acquire 212 acres of surplus property in the south of this site for use as a park. Other priorities and circumstances aside, it appears to be reasonable for

<sup>&</sup>lt;sup>2</sup>NOAA Vessel Moorage Alternatives Study, Robert G. Albrecht, P. E., September 1975.

City of Seattle park plans to be extended to include appropriate use of the NOAA site. However, fund shortages and the City's support of the NOAA project have confined the City's attention to park and recreation use of the 212 acre portion of Sand Point.

Park and recreation use of the site would offer a large degree of flexibility for accommodating public interests and needs. With a park, natural areas as well as athletic fields, boating, cultural and recreational facilities are usually appropriate and in public demand. Many potential environmental resources of the pre-airport circumstances could be reestablished along with the developments to support an extensive and varied program of recreational activities.

#### d. NOAA Research Complex

The most recent City of Seattle Comprehensive Plan has identified two primary land uses as being appropriate for the Federal lands at Sand Point. (See Exhibit B.) The northern and western portion is designated "Governmental, Educational and Related Uses." The proposed NOAA use appears to qualify according to this criterion. The City of Seattle, King County and the Governor have indicated support for establishing the NOAA Center at Sand Point.

The NOAA complex would occupy a 114-acre portion of the site, the proposed park about 212 acres. Aside from the NOAA Center being necessary to meet NOAA's needs, the Center would be a unique extension of the recreational-educational functions of the park. Tours, observation points, interpretive facilities and educational displays within the NOAA complex would be typical ways to accommodate public interest in and curiousity about the research and scientific service activities proposed on the site.

Any development on the surplus land would have to be environmentally sound, according to present environmental standards and local public expectations. Both the proposed city park and the NOAA facility would have to meet this standard. An additional requirement from a public interest standpoint is for any facility to reclaim as many as possible of the environmental resources lost when the present airport facilities were constructed. The

NOAA Center would help to meet these requirements in significant ways.

## e. Commercial and Special Purpose Educational-Recreational Use

In the past five years, a number of uses in this category have been proposed. Prominent among them have been a drag racing strip and motor racing track, general aviation airport, bicycle racing course, historical museums, hotel, motel, trailer park and educational facilities. While these proposed uses are not all that have been proposed or that could be conceived for this category, they are representative. Most of these possible uses emerge as uses which would capitalize on the existing runway pavement, the large hangars and the large amount of space available. Some would probably be compatible with the kind of park planned by the City of Seattle, or even a natural area, and some would probably be acceptable to the adjacent residents. But compared to other possible uses, this category of use seems least likely to provide for reclaiming environmental features of the site lost in the construction of the existing airport. Moreover, certain of the uses have attendant adverse environmental effects such as noise and visual blight. Probably the general public interest would not be served as well by any of these uses as by park, educational, and research uses. In sum, fewer people would be served and fewer broad public needs and goals would be met by uses in this category. Few, if any of these uses are water-related or water-dependent as would be required by local shoreline management policies.

#### f. Multipurpose Use

In the recent public discussion of the best use of surplus property at Sand Point, one proposal has been to use the site as a park, NOAA Center and general aviation facility. The General Services Administration identified this use as its preferred alternative in its Draft Environmental Impact Statement published in August 1973. The benefit of this proposal accrued in the largest part to the airport use which was set in 108 acres in the center of the site, preempting convenient access routes and backup space needed for proposed park and NOAA uses. In this proposal 160 acres would have been made

available for park purposes, 70 acres (including 25 acres not declared excess by the Navy) would have been allocated to NOAA. The airport would sharply reduce the potential environmental quality of a NOAA Center, a city park and the surrounding community by subjecting them to visual blight, high levels of aviation noise and to airplane accident hazards. In their final EIS, GSA conformed to congressional action precluding conveyance of excess property at Sand Point, unless the City of Seattle, King County and the State of Washington could present a mutually agreeable plan for aviation facilities on the site. On December 19, 1974, GSA formally conveyed the property to NOAA. In late 1974, aviation promoters contested GSA's course of action in court and at the local public policy level. Both efforts were ineffective.

#### g. Residential Use

In the Lake Washington Basin, most of the highly valued residential land enjoys lake views or access to the lake. Thus from a private owner's viewpoint, all of the surplus property at Sand Point would be highly desirable private or public residential property. This use probably could not overcome the likely public demand that the entire site be used for public or even commercial uses.

#### 3. Summary

The NOAA portion of the site, as well as the portion intended for park and recreation use, could be used for one of many possible uses, and most uses have some advocating constituency in the area. Moreover, the site could possibly accommodate a highly varied mixture of activities. However, the resolution of these competing demands has a base point of more purely environmental and public use standards than economic and private use. The State Shoreline Management Act and City of Seattle policies are evidence of such standards. In addition, it should be noted that in the previous public discussions of possible uses of the site, public and environmentally sound uses are advocated by an apparent majority of area citizens.

The proposed NOAA Center has the apparent requirement to meet local environmental and public use needs as much as possible.

#### **PART III**

## The Proposed Action and Existing Conditions

#### A. THE PROPOSED ACTION

#### 1. Description of the Site

#### a. Location

The site is a 114-acre<sup>3</sup> portion of the former Sand Point Naval Air Station. (See Figure 3.) The remaining Navy facility, the Naval Support Activity (NSA), utilizes approximately 150 acres. A third portion, approximately 212 acres, is expected to be conveyed to the City of Seattle for use for park and recreation purposes.

The property is situated on the west side of Lake Washington, east of Sand Point Way, generally east of 75th Avenue N.E. if extended, on the geographical site known as Sand Point. The site is bounded by a line beginning near the southwest corner of Building 33 and running approximately 680 feet due east, then due south approximately 750 feet, then due east approximately 350 feet, then northeast (approximately azimuth 033°T) 850 feet, then due east approximately 1,250 feet, then northeast (approximately 030°T) 900 feet to the lake margin and by a due north-south line starting at the southwest corner of Building 33 and running due north about 1,600 feet to the lake margin. (See Figure 4, Vicinity Map, and Figure 5, Sand Point Map.)

#### b. Existing Facilities

Buildings presently located on the site are:

Building 1 — Aircraft Hangar
Building 32 — Aircraft Hangar
Building 33 — Aircraft Hangar
Building 102 — Engine Test Stand
Building 122 — Inert Storage
Building 247 — Maintenance Storage

Building 121 — Storage

Building 21 — Magazine Building 264 — Control Tower

A seaplane ramp and small boat launching ramp are located in the northwest corner of the proposed site. The primary runway of the air station is oriented on an azimuth of N 14° 59' 59" W and has an overall length of about 4,900 feet. The proposed site includes about 1,550 feet of the northern end of this

<sup>3</sup>A government survey of the NOAA site established that the total dry land acreage was 113.98; an additional 2.21 acres of submerged area was included.

runway. (Source: NAVFAC Drawing Number: 1,246,853)

## 2. NOAA Center Site Organization Concept

An open low scale arrangement of building clusters is planned in three activity zones. In zone 1, nearest the pier area and the north gate entrance, is the shop, storage, and ship activity cluster. At the east-west midpoint of the site is zone 2 which includes Center management, operations support and eating facilities, and biological, chemistry and electronic laboratories. Zone 3, the area of lowest level activity, lies along the eastern and southern portions of the site. Near the east boundary is the education center complex, and near the main entrance from the park and from Sand Point Way is the visitor center. Along the shoreline near the education center is an aquaculture research and demonstration lagoon which would serve as a visual amenity as well as the site for fresh water salmon rearing research. Major buildings of the operations and research zone would be connected with covered walks. (See Figure 6, Site Concept).

The openness of the plan and the large spaces between buildings would allow future expansion without interfering with adjacent facilities and their uses.

#### a. Interior Structures

New Construction. Current estimates identify a 1981 space requirement of about 450,000 square feet of on-shore building space. Nine separate building clusters are presently planned. The detailed characteristics of the buildings needed to meet requirements will be determined in the design phase to come later. Soil tests and present requirements indicate that one- or two-story structures would be suitable in all cases.

Utilization of Existing Structures. All existing naval buildings on the site except Buildings 1, 32 and 33 are expected to be removed as the development schedule requires. Buildings 1 and 32 are expected to be modified for use as storage and work space; Building 33 is expected to be utilized as temporary work space and materiel storage. The control tower is presently being used as temporary office space. Existing paved areas and roads will be utilized wherever possible, but it is expected that a large percentage of

the present pavement will be removed or covered with earth.

Utilities. The existing utilities system on the site is probably inadequate to serve the proposed Center. A new heating and cooling system is required. This system could be built and operated in cooperation with the present NSA system if this should prove feasible. Presently, a 14-inch water main lies immediately west of Hangars 32 and 33. This line is adequate to serve the proposed Center. Most of the existing storm sewers on the site will have to be relocated or removed and replaced in order to accomplish a complete surface water control system expected to be needed for the Center. A new power substation is required, and new telephone service is necessary.

New sanitary, bilge water and ballast water sewerage service is required. New facilities for settling of the bilge and ballast water may be required if use of the existing Navy facilities proves unfeasible. With the installation of a new pumping station, disposal of liquid waste can be accomplished through the present METRO system. Solid waste disposal after construction of the Center can be accommodated through the presently available commercial system.

#### b. Over Water and Shore Construction

Pier Construction. Present plans specify berthing for 12 vessels by 1981. The larger vessels are about 300 feet in length; others vary in size to less than 100 feet; vessel drafts range from 9 to 19 feet. In addition, a small boat basin is planned for mooring hydrographic launches and small reconnaissance craft which cannot be stored in dry shelter. (See Exhibit C, Vessel Inventory.)

Larger vessels require a 30-foot depth at pierside in order to minimize possible lake bottom disturbances from vessel operations. Optimum pier height above mean lake level is 8 feet. A staging area approximately 100 feet wide is planned at pier height, requiring that the staging area surface be raised approximately 4 feet at shoreline to achieve this height. Reinforced concrete piling and pier surfaces are planned. Provision for water, fuel handling, sanitary, ballast and bilge water systems will be incorporated into the design of the piers.

The preferred approach for meeting

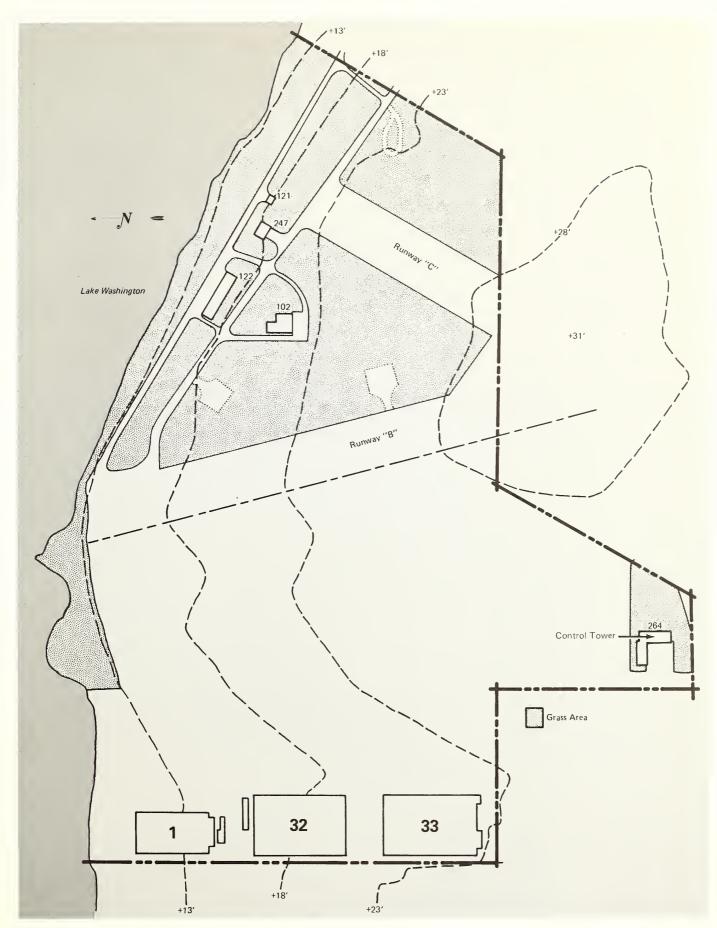


FIGURE 3. NOAA Site

moorage requirements is illustrated in Figure 7. Key characteristics of the plan are:

Dredge volume
Staging area fill volume 60,000 cy
Dredged area
Lake surface involved567,000 sf
Shaded lake surface80,000 sf
Shoreline involved
Total large vessel space3,030 lf
Total small boat space 520 lf
Piles required (approx.) 150

In selecting the pier plan, four likely plans were considered. (See Figures 7, 8, 9 and 10.) The alternatives were examined primarily in terms of likely environmental impacts. Any choice among the four would meet minimum vessel safety and operational requirements. The preferred plan is the best choice for minimizing adverse aquatic biota, lake recreation and visual impacts.

The environmental parameters considered are listed on the left of the camparison table, Table 8, comparative ratings are displayed on the right.

Dredging and Revetment Construction. The dredged material would be spread inland behind an earth berm and used as a part of the general site preparation. The material would be spread and dried on the site in order to forestall possible lingering odors. A riprap revetment is planned to protect the shoreward face of the dredge area.

A 2-acre lagoon is planned at the eastern portion of the site. Approximately 100,000 cubic yards of material would be removed. (See Figure 6.) The lagoon would be both an aesthetic amenity, and the site for freshwater salmon rearing research and demonstration activities.

#### c. Related Site Treatment and Landscaping

A raised staging area and ramp is planned in back of the pier system. This is to be constructed on fill soil from the dredging or other site preparations, or imported as needed, and paved. An appropriate runoff collection and disposal system would be required in connection with all paved areas.

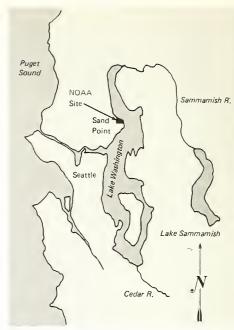


FIGURE 4. Vicinity Map

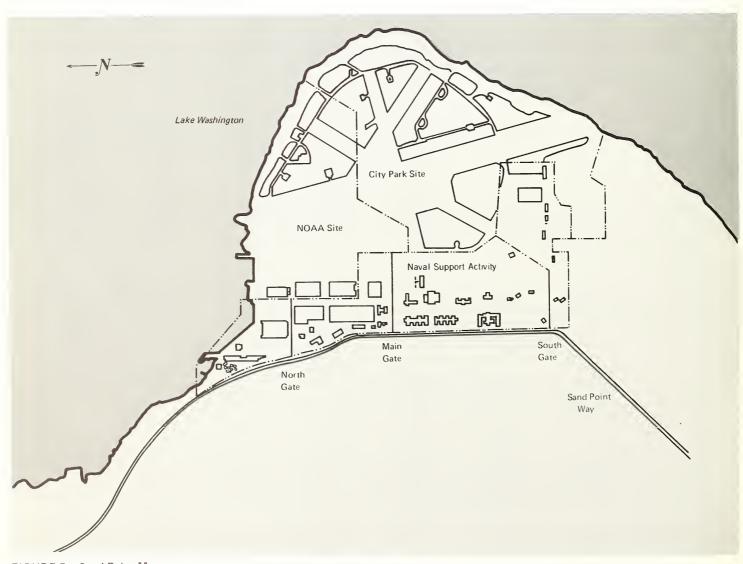


FIGURE 5. Sand Point Map

TABLE 8. Comparison of Adverse Effects of Pier Configuration Alternatives

ENVIRONMENTAL QUALITY DA DAMETERO	DDEEEDDED	ALTERNATIVES				
ENVIRONMENTAL QUALITY PARAMETERS	PREFERRED	#1	#2	#3		
Extent of Shoreline Utilization for Ship-related Activities	L	L	L	Н		
Shoreline Configuration Change	M	L	Н	Н		
Shoal Configuration Change	M	L	Н	Н		
Benthic Community Change from Dredging	M	L	Н	M-H		
Benthic Community Change From Filling	L-M	M	L	Н		
Effects on Recreational Use of Lake	L-M	Н	Ł	L-M		
Changes in Visual Conditions	L-M	Н	L-M	L		

L = Lowest amount of adverse change in present condition.

Extensive landscaping would be utilized on the site. Plans specify maximum use of trees, shrubs, grass and flowers together with mounds, hillocks and rock arrangements as appropriate for a visually pleasing Center. Automatic or manual irrigation systems will be provided.

#### d. Public Service Facilities

A visitors' center is planned adjacent to the main entrance boulevard. Provided funds are available, the center will be staffed with guides who would provide public information and conduct tours. Information stations, interpretive signing and educational displays would be featured in the visitors'

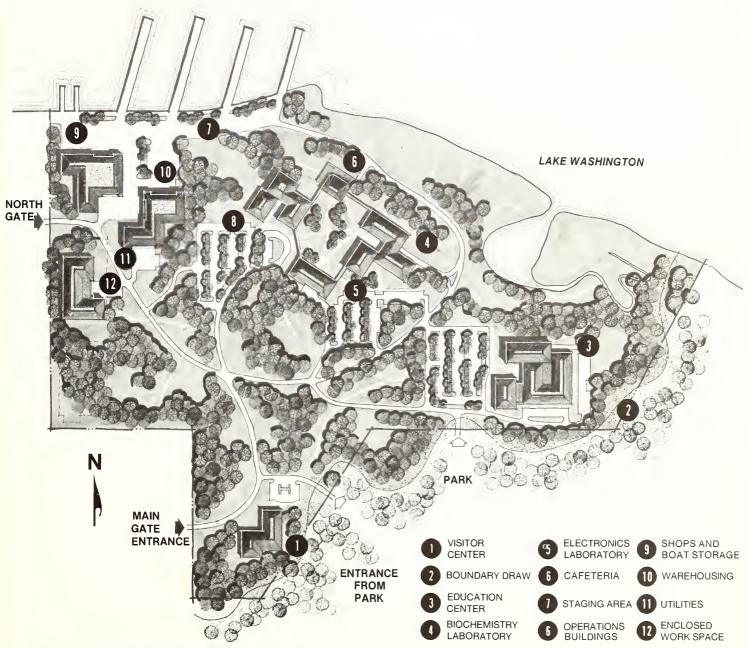


FIGURE 6. NOAA Site Organization Concept Illustration

M = Moderate amount of adverse change in present conditions

H = Highest amount of adverse change in present conditions.

center and at appropriate points over the site. In the design of the buildings and the piers, attention will be given to establishing appropriate corridors, observation points, and viewpoints necessary to facilitate public touring.

#### e. Access and Parking

Recent estimates indicate that the NOAA Center will generate a maximum peak hour traffic load of about 540 vehicles along Sand Point Way N.E. and through the NSA, depending on the number of vessels on station. Estimates are that about 1,600 trucks per year would be serving the new facility by 1980. Peak day activity (worst case) would be no more than 20 trucks. This would occur only during the months of November through February. A more typical average day during the November-February period would be ten to 12 trucks. May through September averages would be four to five trucks per day. On some days there would be no trucks.

Minimum accommodations for this increase in traffic may require some revision of the present NSA circulation system. Such revisions will be subject to the approval of NSA officials. A refurbished north gate entrance through NSA grounds to the NOAA site is planned for accommodating trucks, vendors and some NOAA employees. NSA officials have agreed to allow NOAA personnel and official visitor passage through the NSA Main Gate, to the extent that the present traffic capacity will allow. Sightseeing visitors to the NOAA Center will be directed through the park entrance at the south end of the NSA. Appropriate traffic signing and signals would be necessary.

In connection with the proposed access arrangements, NOAA incurs the obligation to provide security measures which would meet Navy requirements, and to negotiate with the City of Seattle security and access relationships between the NOAA Center and the park. Onsite parking for 950 - 1050 vehicles would be provided in spaces dispersed throughout the facility.

#### f. Vessel Operations and Pier Area Activities

Present levels of vessel-related activity at the Lake Union ship base characterize the activity to be transferred to Sand Point. In a typical year, an active NOAA vessel would be at sea approximately 8 months and berthed in port the remainder of the year. Vessels engaged in research in North Pacific waters come to port several times during the research season. Inactive vessels are maintained in port at minimum levels. As of Fall 1975, nine NOAA vessels are based on Lake Union and are active. (See Exhibit C).

Transit for NOAA vessels from Puget Sound to the present east Lake Union berthing area is through the Lake Washington Ship Canal, a distance of about five miles. This course involves transit through Shilshole Bay, Chittenden Locks, under the Ballard Bascule Bridge and the Fremont Bascule Bridge, and across Lake Union to the NOAA Pacific Marine Center. In 1972 and 1973, approximately 100 such transits occurred. Only 48 transits occurred in 1974.

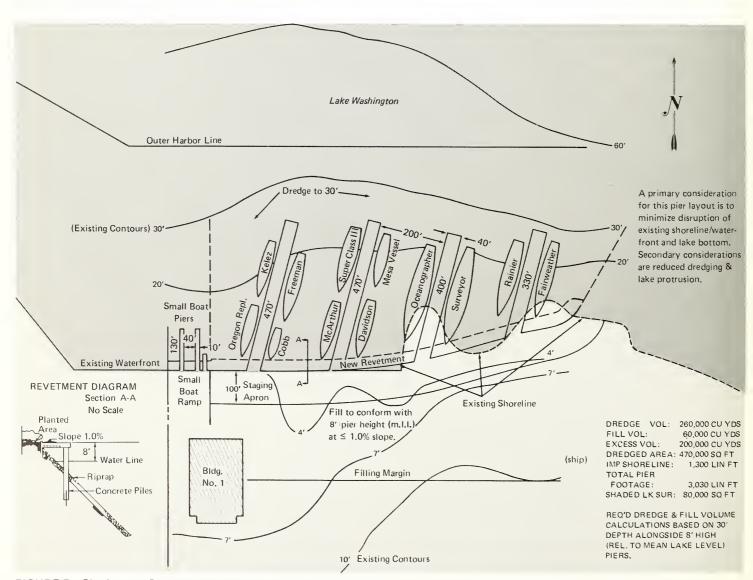


FIGURE 7. Pier Layout, Preferred Alternative

Transit from Lake Union to Sand Point would involve a course under the University and Montlake Bridges, around Webster Point to the north end of Sand Point.

During times of adverse weather conditions or when significant vessel repairs are required, NOAA vessels berth temporarily at ship yards, at Piers 90-91 or at other available moorages.

NOAA vessel movement in fresh water is scheduled only during midmorning and midafternoon weekday hours in order to minimize peak hour bridge traffic disruptions and to reduce possible disturbance to pleasure boat activity. Only in rare emergency circumstances is tug boat assistance required for NOAA vessels in fresh water operations. NOAA vessels move at 4 knots in fresh water in order to allow for safe vessel control and minimum emergency stopping distances. Recent observations indicate that at 4 knots no NOAA vessel would create wakes hazardous to small craft or to shorelines. Figure 11

provides a visual representation of wakes created by a typical NOAA vessel traveling at 4 knots.

Routine maintenance of NOAA ships is presently undertaken at pierside on Lake Union. Repainting, washing, welding, and equipment repairs and modifications are typical maintenance activities. An estimated 230 pounds of paint is removed and replaced each year on NOAA ships. In most cases, the paint is removed by scraping, sanding or wire brushing. Most of the chemically inert chips and powder removed are recovered before falling into Lake Union.

Several times in the past 10 years, heavily eroded portions of vessels have been sand-blasted at pierside before repainting. Sand-blasting of the entire hull for repainting is done in commercial shipyards. Non-lead based paints, such as vinyl or alkyd enamels, are used for repainting. Negligible amounts of fresh paint come in contact with the water.

Generally, commercial cleaners are used to prepare metal vessel surfaces for repainting. These cleaners are food grade liquids which are highly water soluble, nontoxic and biodegradable. They are used in dilute form at ratios of one part cleaner to ten parts water and one part cleaner to 30 parts water. After the dilute cleaner is applied to vessel surfaces, it is hosed off into the lake. Approximately 45 gallons of the liquid concentrate are used each year. There is no known toxic effect on waterfowl, aquatic biota or humans from these cleaners.

Typical repairs and modifications to the vessels are winch testing and recabling; equipment relocation and welded repair; installation of new winches and electronic machinery; and welded deck structure modification and repair. Repair tasks requiring special equipment and extensive structural modifications are accomplished in commercial shipyards.

Fueling of vessels is accomplished at

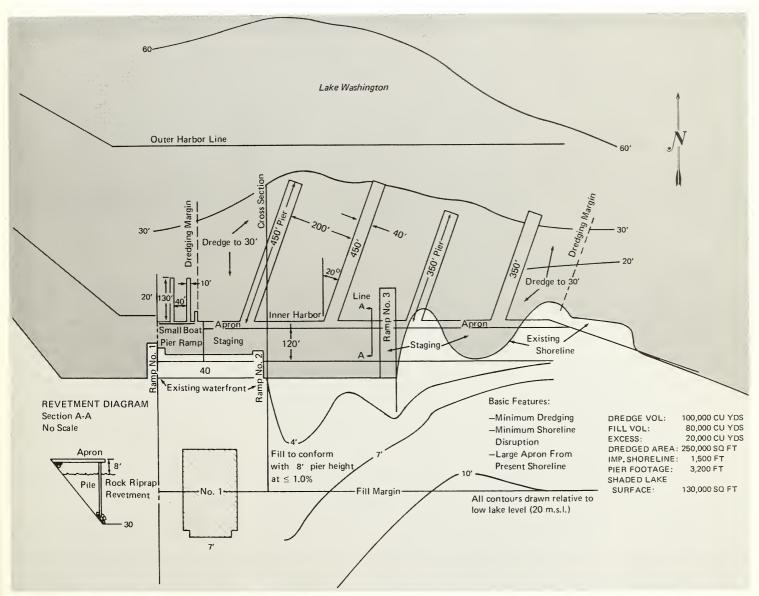


FIGURE 8. Pier Layout, Alternative #1

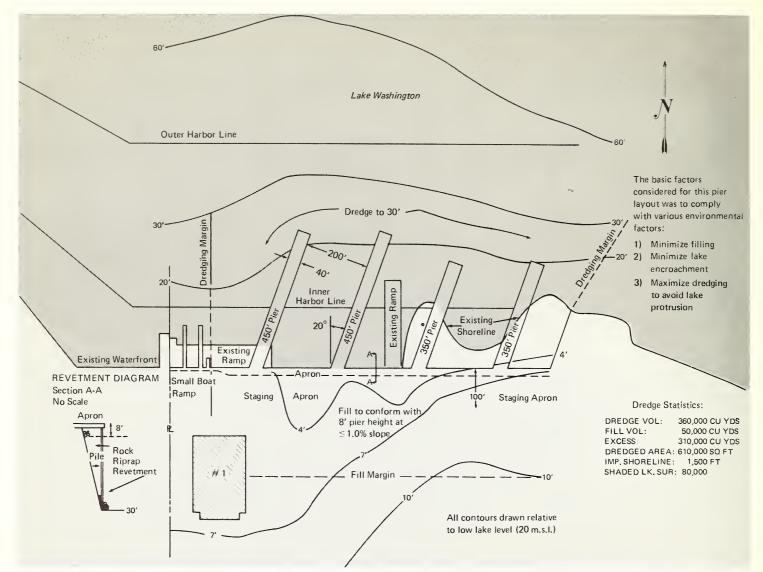


FIGURE 9. Pier Layout, Alternative #2

either Point Wells or Manchester in west Puget Sound. There is some fuel handling on board ships in connection with maintaining ships. Such handling rarely involves more than 30 gallons. As a preventive measure against accidental petroleum liquid spills, all NOAA vessels based at Lake Union presently utilize a "Slick-bar Mark 6" oil containment boom surrounding the vessel hull at waterline. In 1973, there were five accidental petroleum liquid spills attributable to NOAA ship operations, involving a total of less than 10 gallons of fuel or oil. These accident episodes occurred in the NOAA pier area, and in all cases the petroleum liquids were recovered quickly within the containment boom. No spills attributable to NOAA activities occurred in 1974.

Safety and security needs in the pier area require night lighting of no greater intensity than residential street lamps. Higher intensity lights are required for emergency use. Permanent cranes are not used, as most

heavy lifting tasks can be accomplished with rented mobile cranes. Equipment and supplies are moved by trucks and battery-powered electric fork lifts. NOAA staging area maintenance standards require that surfaces be kept clean and orderly with equipment and supplies stored when not in use.

Practices described above, related to vessel operations maintenance and to pierside activities, will be continued at the Sand Point Center.

#### g. Project Reviews

NOAA has committed to reviewing development plans, project designs and project progress with the Sand Point Community Liaison Committee, with the Seattle Department of Parks and Recreation and other appropriate city departments, and with NSA officials.

The Community Liaison Committee was established by the Seattle Mayor and City Council for the purpose of monitoring all

development activities at Sand Point. Committee membership and representation are listed in Exhibit D.

In response to public hearing comments and written comments on the DEIS, NOAA has committed to a number of Center design principles which in effect assure a visually appealing and functional compatibility between the NOAA and park development as well as the existing NSA facility.

City department, Liaison Committee and NSA reviews are to ensure the fulfullment of these commitments. The following principles describe the essential content of NOAA's commitment:

- The boundary between NOAA and the park will be visually appealing in terms of its design relationship to other park and NOAA design elements. (See Figure 12.)
- Topographic design of both the NOAA Center and the park will be continuous and unified in concept

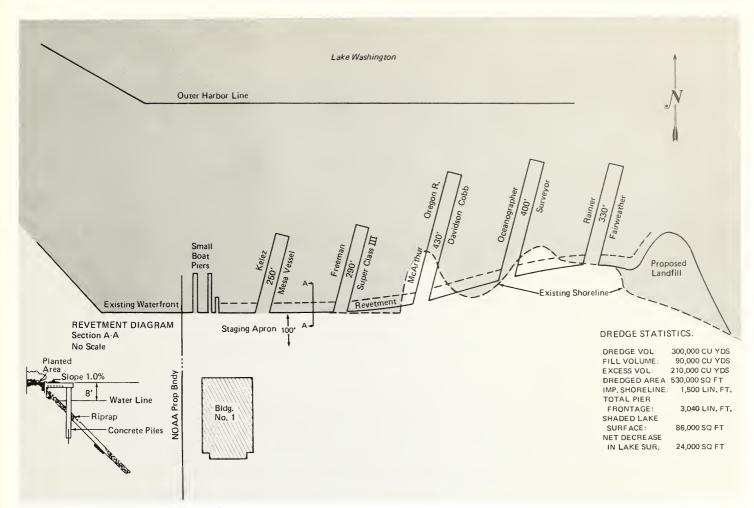


FIGURE 10. Pier Layout, Alternative #3

- Landscaping elements will be compatible between the two facilities
- NOAA parking spaces will be sited to allow maximum joint use by park and NOAA users
- Pedestrian and vehicular traffic between the two developments will be integrated with landscaping, topographic changes and security arrangements, and allow convenient flow to and from both developments
- Pedestrian and vehicular traffic to and from Sand Point Way will be accommodated so as to minimize disruptions to traffic flows along Sand Point Way and within the surrounding neighborhoods
- Plans for traffic handling will involve NSA, park, NOAA and neighborhood representatives in order to ensure reasonable accommodation of the interests of all concerned.

#### B. EXISTING CONDITIONS

#### 1. Condition of the Site, Circa 1920

The following material is drawn from research conducted for NOAA by Diana Bower, Community Planning Consultant, Seattle.



FIGURE 11. NOAA Vessel Wake Illustration

In most project development situations, the baseline environmental circumstance would be the present conditions. This is inappropriate at Sand Point where successive phases of grading, paving and environmental abuses as a result of aviation use of the site have severely reduced, if not eliminated, significant natural site conditions. (See Figure 13.) Therefore, the most appropriate environmental baseline for the site is the pre-aviation condition, about 1920 and before.

Before 1920, the NOAA site was a typical low-lying lakeshore area with stands of second growth cedar, hemlock and Douglas fir. (See Figure 14.) A marshy bay, Pontiac Bay, was clearly identifiable at the northwest corner of the site. There were several hills near the central and eastern portion of the site, but most of the area was low and covered with brush.

At this time, the site was markedly rural in character. Developments on or adjacent to the site were a chicken farm, an orchard, a dahlia farm, Carkeek Park (1918-1926), and the Northern Pacific Railway. Mud Lake, on the southeastern portion of Sand Point, was a popular picnic and fishing area. In addition to the evergreens mentioned above, plants noted on the site in the 1920's included native willows, red alder, vine maple, balmof-Gilead, cottonwood, madrona, red-osier dogwood, rosy spirea, ocean spray, red elderberry, salal, swordfern, foxglove, trillium, wild mint, wild blackberry and red huckleberry. (See Figures 15 and 16.)

With the completion of the Lake Washington Ship Canal in 1916 and the lowering of Lake Washington by 8 feet, some of the natural appeal of the shorelines was lost. The previous sandy beach ringing the peninsula receded from visual prominence, making the remaining gravel shoreline the charactersetting feature of the site at water level.

A wide variety of native mammals were found on the site. Otter, beaver, muskrat, chipmunk, squirrel, skunk, mice, and others were noted in the mid-1920's. A profusion of birds, both land and water, were also evident. Grouse, quail, pheasant, a half-dozen species of duck, owls, blue heron and many others were reportedly observed before the construction of the first aviation facility in 1921.

The southern portion of Sand Point, including Mud Lake, was largely swampy. Mud Lake supported a range of fish, including trout, catfish, bass, crappie and some steelhead.

The northern portion of Sand Point was more rolling, drier and covered with evergreens and typical green undergrowth. Pontiac Bay was fairly shallow with a marshy, muddy shoreline, a condition which was intensified when the lake was lowered. 20-, and 50-foot high hills were dominant landforms on this portion.

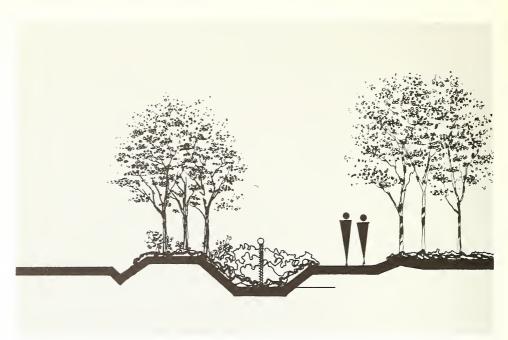


FIGURE 12. NOAA and Park Boundary Design Concept

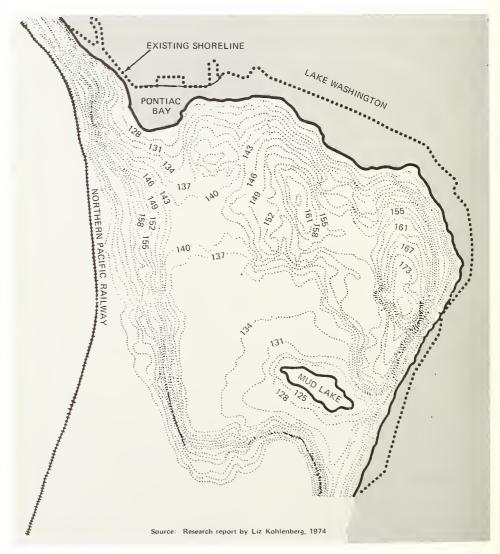


FIGURE 13. 1907 Sand Point Natural Shoreline Configuration in Relation to Existing Created Shoreline

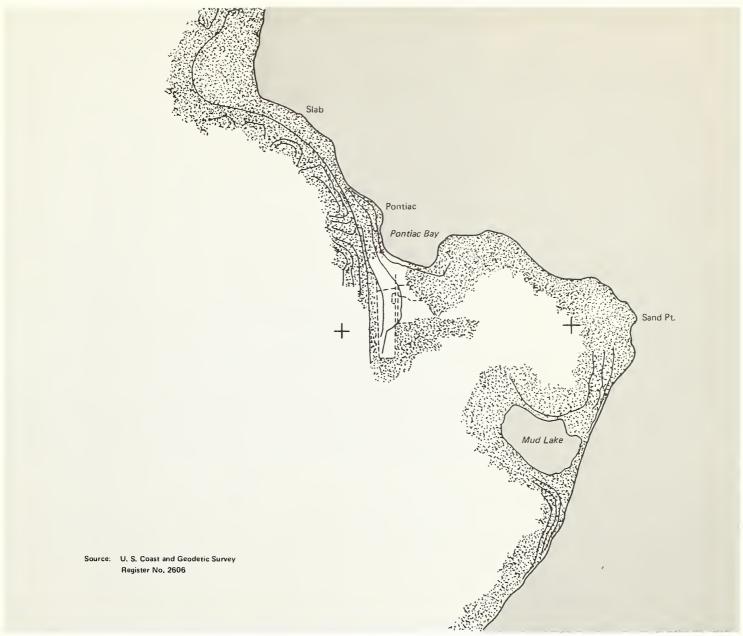


FIGURE 14. Map of Pontiac Bay, Sand Point and Mud Lake, 1902

During this time, heavy traffic was common on Lake Washington. Observers noted scows hauling vegetables and other farm produce, countless log booms, coal barges and brick barges. A number of lake steamers called at landings along the lakeshore. Fish in Lake Washington near Sand Point included several species of salmon, trout, squawfish, perch, chub, and others.

The use of Sand Point was not without debate in this period. The County government was interested in stimulating the formal establishment of an airport on the site. In 1921, a 500-by 2,000-foot strip was cleared at the northwestern portion of the site for airport use. A year later a half-mile extension was cleared. Earlier, Lake Washington was seen as an ideal heavy industry site. Trying to justify expenditure for the

ship canal, in 1871 a Government engineer envisioned Sand Point as a fresh water moorage for warships and other naval vessels. And Virgil Bogue, in his plan of 1911, proposed most of Sand Point as industrial sites and waterways, leaving a small portion at the east shoreline for a public park.

#### Conclusions

There was not much of the natural character of Sand Point that was unique to the area save for its size as an undeveloped lake point, and Mud Lake, which was unusual for its position just a hundred yards from the Lake Washington shore. Ahead of wildlife, fish and natural vegetation of the site, the most significant feature was its bucolic

atmosphere, enhanced considerably by the visual presence of Lake Washington.

#### 2. Natural Conditions and Resources

#### a. Air Quality

This section was drawn from information supplied to NOAA by the Puget Sound Air Pollution Control Agency, Seattle, Washington, A. R. Dammkoehler, Air Pollution Control Officer.

Air Quality Standards. Since 1969, ambient air quality standards have been in effect in the State of Washington. The standards have been amended and expanded in scope a number of times since then. The standards applicable to the proposed NOAA development are shown in Table 9.

In addition, emission sources, including

vessels, must meet the emission standards of Regulation 1, Puget Sound Air Pollution Control Agency. These standards include the visual standard of Ringelman 1 after July 1, 1975, for ships constructed after March 13, 1968. Ships constructed before March 13, 1968 must meet the Ringelman 2 visual standard.

Present Air Quality Conditions. Air quality in the Sand Point area is typical of an urban residential setting that is separated from major freeways and industrial areas. Overall air pollutant levels are low, if measurable, and there are no significant seasonal fluctuations. Pollutant concentrations in any area are increased when low wind or stagnant air conditions exist for extended periods. The Sand Point area is fortunate in this regard since in a typical year, more than 98% of the time, winds in the area exceed 1.5 knots.

Two air pollutants are of concern as a consequence of the NOAA Center development: carbon monoxide (CO) and suspended particulates. The major emission source for CO is the internal combustion engine. Thus, the more automobiles, the slower the traffic flow, and the more stable the air, the higher the CO concentrations in and adjacent to a traffic corridor. Major sources of suspended particulates are dust from unpaved roads and parking lots, fireplaces, open burning, and industrial activities such as steel mills and wood and metal products manufacturing. Diesel engines emit particulate matter also.

The 1974 Air Quality Data Summary published by the Puget Sound Air Pollution Control Agency indicates that suspended particulate levels are less than 40 micrograms per cubic meter as an annual geometric mean for the Sand Point area. The Puget Sound regional standard is not to exceed 60 micrograms per cubic meter, annual geometric mean. By contrast, the western portion of the Lake Washington Ship Canal, through which NOAA vessels must pass, has significantly higher concentrations of suspended particulates. Fifty micrograms per cubic meter is the annual geometric mean recorded at the particulate sampling station adjacent to the canal on the Coast Guard Base, 2700 West Commodore Way. Industrial as well as mobile emission sources account for the higher level of air contaminants in this area. Data from the Commodore Way monitoring station is used as the baseline for assessing air quality effects of NOAA vessel movements. Present background CO levels in the Sand Point area are estimated to be 2 milligrams per cubic meter in a typical eight hour period, as against a standard of 10 milligrams per cubic meter.

#### b. Climatological Factors

Information for this section was supplied by the Seattle Forecast Office, National Weather Service.

Winds and Storms. At Sand Point the

TABLE 9. Air Quality Standards

		N		PUGET SOUND				
	PRIM	MARY	Notes	SECO	NDARY	Notes	REGION	
SULFUR OXIDES	ug/m <sup>3</sup>	ppm		ug/m <sup>3</sup>	ppm			
Annual Average	80	.03	a			a	.02 ppm	
30-day Average						a	.04 ppm	
24-hour Average	365	.14	b			a	.10 ppm	
3-hour Average			b	1,300	.50			
1-hour Average						С	.25 ppm	
1-hour Average						a	.40 ppm	
5-min. Average				ļ		d	1.00 ppm	
SUSPENDED PARTICULATES				ug/m <sup>3</sup>				
Annual Geom. Mean	75		a	60		a	60 ug/m <sup>3</sup>	
24-hour Average	260		b	150		b	<b>150</b> ug/m <sup>3</sup>	
CARBON MONOXIDE	mg/m <sup>3</sup>							
8-hour Average	10	9	b	sar	ne		same	
1-hour Average	40	35	b	sar	ne	same		
PHOTOCHEMICAL OXIDANTS	ug/m <sup>3</sup>							
1-hour Average	160	.08	b	sar	ne	same		
NITROGEN DIOXIDE								
Annual Average	100	.05	a	same		same		
HYDROCARBONS								
3-hour Average	160	.24	b	sar	ne		same	
STATE AND REGION PARTICLE	FALLOU	TSTAN	DARDS	(No Natio	nal Stand	ard)		
Industrial Areas (a)	10 a	rams/me	ter <sup>2</sup> /moi	nth (	28.6 tons	/mile <sup>2</sup> /mo	nth)	

10 grams/meter\*/month (28.6 tons/mile\*/month) Industrial Areas (a) (14.3 tons/mile<sup>2</sup>/month) 5 grams/meter<sup>2</sup>/month Commercial-Residential Areas (a)

ppm = parts per million ug/m<sup>3</sup> = micrograms per cubic meter mq/m<sup>3</sup> = milligrams per cubic meter

- a Never to be exceeded
- b Not to be exceeded more than once per year
- Not to be exceeded more than twice in seven days
- d Not to be exceeded more than once in eight hours

Source: Puget Sound Air Pollution Control Agency.

prevailing winds are from the south and southeast, making the NOAA site somewhat more protected than other portions of the area. Summer winds are generally light with evening winds often increasing to eight-15 miles per hour. Winter winds are more forceful and usually associated with storms moving inland from the Pacific Ocean. Strongest winds are southerly and occur occasionally at speeds in excess of 60 mph, but rarely in excess of 90 mph.

Thunderstorms are infrequent, averaging six per year, and are quite light in intensity.

Precipitation. Puget Sound has a welldefined dry season (June-August) as well as rainy season (October through April). Rain decreases gradually in early spring. Precipitation in the rainy season is usually light or moderate in intensity, so that continuous or heavy downpours are infrequent. The number of days with 0.10 inches of precipitation averages ten-12 days per month from November through March, then decreases to a minimum of two days during July and August. Annual snowfall amounts range

from only a trace to about 30 inches. Snow depth on the ground rarely exceeds six inches, and it seldom remains beyond a few

Sunshine, Fog, Cloudiness, Over a year's time, the Puget Sound area receives about 45 percent of the possible sunshine at this latitude. Average sunshine amounts range from 24 percent of possible sunshine in December to 62 percent in July. Heavy fog occurs an average of five to ten days each fall and winter month, and from one to three days the remainder of the year. Changes in cloudiness follow the rainfall pattern, reaching a maximum during October through April and a minimum during July and August. Long-term records show an average of 23 cloudy days for December and January, with gradually declining cloudiness during the spring months to a low incidence of ten days during July.

Temperature. Winter temperatures are mild for the latitude with highs in the 40's, night lows in the 30's and with belowfreezing temperatures observed on an aver-

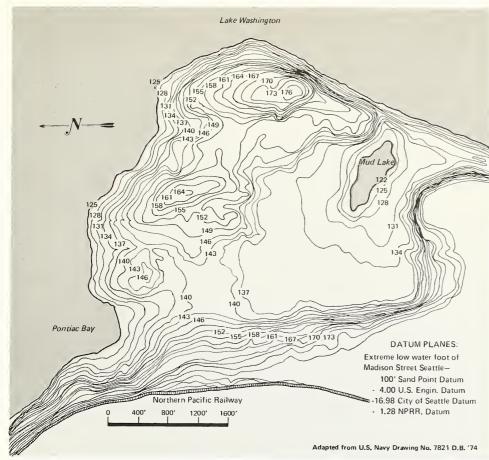


FIGURE 15. Sand Point Topography

age of 30 days each winter. Below zero temperatures have rarely been recorded in the Lake Washington vicinity. A typical summer day has highs in the upper 70's with night readings falling into the 50's. On an average, the temperature exceeds 80 degrees 17 days a year and rises above 90 degrees about two times a year. Temperatures in the Lake Washington area have never been recorded above 100 degrees.

#### c. Water Quality

Information for this section was supplied by the staff of the NOAA Northwest Fisheries Center, Seattle.

Sanitary Sewers. Based on measurements at Matthews Beach, the water quality of Lake Washington at the site contains less than 20 coliform colonies per 100 milliliters. This is well below the State Department of Ecology standard of 240 organisms per 100 milliliters for swimming and other recreational uses. In a formal opinion with respect to residual bacteria from the old sewer outfall at the western end of the site, the Seattle King County Department of Public Health stated that no significant levels of fecal coliform bacteria remain in the outfall. Moreover, the lake environment is not considered conducive to long-term survival of other infectious bacteria forms. The City of Seattle Department of Engineering has indicated that expected sewage load capacity in the Sand Point trunk is sufficient to carry the anticipated volumes of the proposed development, if suitable settling facilities and a lift station are constructed as planned.

Storm Drainage. Because of the aged and probably deteriorated condition of storm drainage resources on the NOAA site, new storm drainage facilities are expected to be required to support the new facilities on the site.

Water Supply. Estimates of maximum peak potable water supply demand for the proposed development are 35,000 gallons per day. The City of Seattle Water Department has indicated that water supply capacity in the Sand Point area is a hundred times greater than the estimated demand.

Water Quality Conditions of Lake Washington. Lake Washington is the second-largest natural lake in the State, with an area of just over 22,000 acres, and a maximum depth of 214 feet. The average depth is 54 feet. The lake has not been known to freeze. Lake water undergoes a long period of vertical mixing during the winter in contrast to the two shorter vertical mixing periods characteristic of lakes that freeze. Oxygen content of the lake is relatively uniform at all depths. The two major sources of inflow to the lake are the Cedar River on the South end and the Sammamish River on the North.

Flushing time for the lake is approximately three years.

Historically, the water quality in Lake Washington began to deteriorate by the mid-1920's with temporary improvement in the early 1930's. By the mid-1950's, Lake Washington was becoming increasingly opaque with algae. Studies showed that sewage effluent was turning the lake into a well-fertilized garden of algae which was rapidly destroying the lake's recreational value and threatening important fisheries. Legislation passed by the State Legislature in 1957 allowed the establishment of the Municipality of Metropolitan Seattle (METRO), an agency responsible for the operation and improvement of metropolitan sewage disposal facilities.

Most streams and lakes of the Lake Washington system have a soft chemical quality, low in dissolved solids (except in the industrialized lower reaches of the Lake Washington Ship Canal) and high in dissolved oxygen concentrations. Chemical evaluations of three locations in the system are shown in Exhibit E: mouth of the Cedar River at Renton, Sammamish River just upstream from its mouth at Bothell, and the Lake Washington Ship Canal downstream from Lake Washington. A continuing study of Lake Washington has been conducted by Dr. W. T. Edmondson of the Zoology Department of the University of Washington. Since the removal of the sewage effluent from the lake, the recovery has been phenomenal. The phosphorus content of the lake has diminished from a high of about 72 PPB in the 1963-65 period to a minimum of about 22 PPB in 1969, a level comparable to that in 1933 when measurements were first initiated.4

Correspondingly, aesthetic conditions have improved markedly with the disappearance of some of the nuisance forms of algae and the surface scums and odors that were typical of the lake as late as 1965. Transparency of the water has increased to a mean depth of 3.5 meters in 1974 from a mean depth of about 1 meter in the 1963-1965 period. (Personal communication from Dr. W. T. Edmondson.)

Water supply, fisheries, and recreation uses require the highest water quality standards; these standards have set the minimum acceptable quality for most watercourses of the Lake Washington system. As a result, the water quality class is either A or AA (extraordinary) with the objective being to meet or exceed the quality requirements for all uses. (See Exhibit F.)

Salt intrusion into the lake is controlled by a salt water barrier at the Government Locks. The salt content in Lake Washington

<sup>&</sup>lt;sup>4</sup>METRO 69, Report on Operations, Municipality of Metropolitan Seattle, January-December 1969.

is negligible with an average content of 60 PPM at depths of over 200 feet.

#### d. Soil

Interior Area. Soils of the site are mostly sandy and silty loams. They are generally conducive to rapid water transfer but are not suitable for supporting heavy loads. Surface and subsurface conditions are satisfactory for all NOAA Center requirements. Water tables near the north shoreline are high (borings indicate a two-foot water table 200 feet back from the shoreline.) Approximately 70 percent of the NOAA site is presently covered with concrete or asphalt ranging from six to ten inches thick. Beneath this cover are several inches of gravel and crushed rock.

Adjacent Lake Bottom. Sediments col-

lected off Sand Point at approximately the midpoint of the lake show an organic content minimum at a depth of about 12.5 centimeters, which is dated to the year 1916 when the level of the lake was intentionally lowered by eight feet at the completion of the Lake Washington Ship Canal and resulted in a redeposit in deeper waters of eroded nearshore inorganic material. The organic content rose from a low of ten percent organic matter (dry weight) in 1916 to a 1958 high value of 22 percent. The phosphorus and nitrogen show a definite increase since the 1916 level as related to the increased productivity; however, more recent sediment sampling off Madison Park has shown that the surface sediments are distinctly less rich, as of 1970, following the discontinuance of waste discharges into the lake. In August 1972 and again in September 1974, a consultant retained by NOAA took sediment samples in the shoreline area of the site and analyzed them for oils, grease, heavy metals, pesticides and volatile solids. Unnaturally high levels of oils, grease and lead were identified. (See Exhibit G.)

Shoreline Quality. The shoreline of the NOAA site is considerably different from its natural configuration. At present the first 600 feet of the shoreline from the western boundary is a concrete seaplane launching ramp. The remaining shoreline on the north is apparently accidental in configuration, a consequence of having been created by soil and rubble disposal in connection with the airport construction. Comparative examinations of old maps of the NOAA site indicate that several hundred feet of shoreline fill has

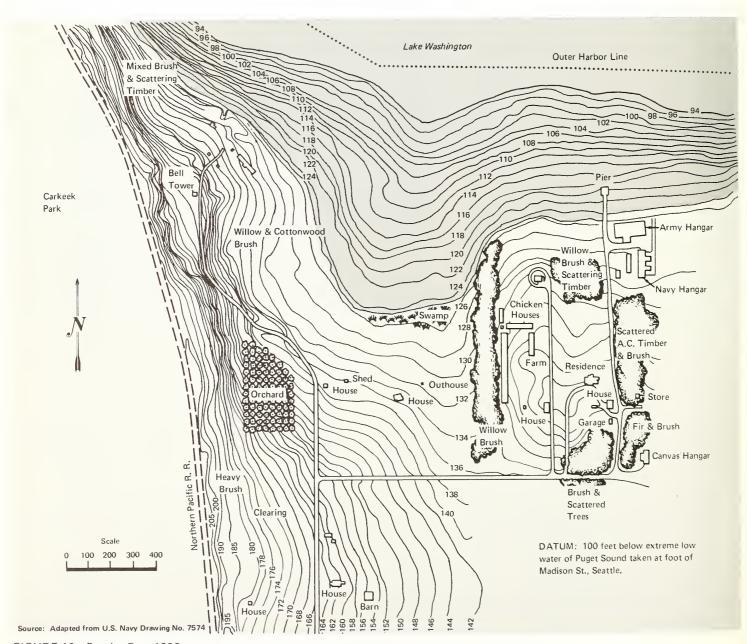


FIGURE 16. Pontiac Bay, 1926

been added in some places, in connection with airport construction. (See Figure 13.)

#### e. Vegetation and Wildlife

Vegetation. There are no unique indigenous plant forms on the site. Plant life on the NOAA site is typical of urban military reservations. Minimum ground cover has been sporadically maintained since the abandonment of aviation activity. Plants such as varied grasses, clovers, plantain and hairy cats-ear are common. There are limited amounts of vetches, lupine and tarweeds. Some evergreen seedlings and deciduous tree seedlings have been observed. Scotch broom, horse tails, thistles and willows are common at this time.

Birds. Records of several Audubon Society visits to the site and personal observations indicate that there is a large bird population using the Sand Point area and adjacent water. Nearly 50 species of birds are commonly observed on the site. An additional 24 species have been observed on

the site but are considered to be common to other habitats. Most of the birds are found on the southern portion of Sand Point, where grassy areas and tree growth is more extensive. (See Species List, Exhibit H.)

Ground Animals. In recent years there has been a sharp increase in the number of domestic cats frequenting the site. Typical ground animal observations include mice, rabbits, an occasional skunk, raccoon or similar common suburban species. The ground animal population appears to be low for the size of the site.

#### f. Aquatic Biota

Information for this section has been drawn from aquatic biota studies by the staff of the Northwest Fisheries Center, Environmental Conservation Division, Seattle,<sup>5</sup> and includes

a fishery study provided by the Washington Cooperative Fishery Unit, <sup>6</sup> College of Fisheries, University of Washington, Seattle.

Study approach and scope. In the research and development of the DEIS for the NOAA Center, it was recognized that while there was adequate information on the flora and fauna of Lake Washington as an entity, there was little specific information regarding the NOAA site and the remainder of Sand Point. In 1974 NOAA undertook a year-long study of the NOAA site and Sand Point in order to:

- identify important plant and animal communities present, and their seasonal abundance
- estimate effects of dredging on the standing biota during the period of lowest specie presence
- estimate effects of pier and revetment construction and NOAA vessel activity on the standing biota
- explore methods of mitigating adverse impacts and enhancing beneficial impacts of the project.

The constituents of the study effort were:

- Literature review. (See Exhibit I.)
- Core samples of the pier area for sediment analysis and toxicity bioassays. (See Exhibit G.)
- Bioassay of important species.
- Biomass estimates of Pontiac Bay, including ecology, timing, distribution of fish, and distribution and abundance of benthos, Zooplankton, Periphyton and plants.
- Water flow pattern observations.

Shoreline Habitat. The Lake Washington shoreline habitat was described by Nishimoto (Exhibit J) according to the basic bottom types available for fish spawning or feeding. The general area of the NOAA site fell into Nishimoto's category of "sandy beaches and bottom" which comprises approximately 25 of 71 miles of the Lake Washington shoreline area. This classification of the NOAA site appears to be erroneous, according to observations by a research team of the National Marine Fisheries Service (NMFS) in 1972 (See Report, Exhibit K). The team found that in the Pontiac Bay area, the bottom was mud over gravel and sand. The character of the bottom type of the NOAA site was studied and reported more extensively by Patten (1975) and generally confirmed the preliminary assessment of the NMFS team. Patten reported that the bottom along the Pontiac Bay area is composed of a soft overlay of silt on a hard glacial till base. The slope of the bottom at Pontiac Bay is unusually gradual for Lake Washington. (See Figure 17.) From

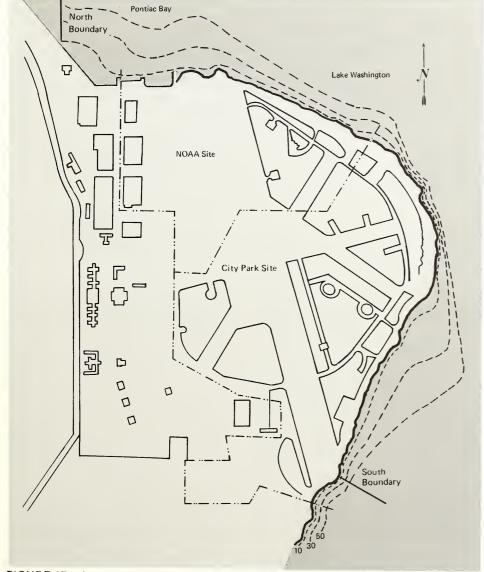


FIGURE 17. Aquatic Biota Study Area and Bottom Contours

<sup>&</sup>lt;sup>5</sup>Preliminary Report on the Aquatic Baseline Assessment of the Environs at the Proposed NOAA Sand Point Development Site, Benjamin G. Patten, Fishery Biologist, September 1975.

<sup>&</sup>lt;sup>6</sup>Fishes Sampled in the Pontiac Bay - Sand Point Area of Lake Washington 1974-75, Michael F. Shepard, Fishery Biologist, August 1975.

Pontiac Bay to the east point of Sand Point the bottom slope increases sharply, then decreases again below the point. The shore wash zone (from 3 feet to the shore) is typically gravel to cobble, with increasing depth. At the lake edge, a number of places are sandy. Pontiac Bay has been altered with cement bulkheads and ramps which have reduced or eliminated the wash zone. The remaining portion is generally of asphalt and rubble fill, forming an abrupt lake edge.

Fish Species in Lake Washington, Wydoski (1972) identified 38 species of fish in the lake; two of these, the pink and the chum salmon, are of doubtful occurrence in significant numbers as species in the lake. Wydoski concluded that they occur only occasionally. Of the 38 species, eight species have been introduced and established in the lake. These are the sunfishes, yellow perch, brown bullhead, carp, tench and three species of salmonid, the brook and lake trout and kokanee. (See Exhibit L.) Hanson (1970) conducted a study of Pontiac Bay, adjacent to the NOAA site and found 14 species present in that area. (See Exhibit M.) The timing of the annual migration of fish in the Lake Washington basin overlaps considerably (Table 10); upstream migration occurs from only March to mid-July.

Shepard (1975) captured 19 species of fish in the Pontiac Bay and Sand Point area, including, in order of abundance: peamouth, yellow perch, northern squawfish, largemouth bass (mostly juveniles) black crappy (mostly juveniles) largescale suckers, sockeye salmon, brown bullhead, prickly sculpin, coho salmon, cutthroat trout, threespine stickleback, steelhead and rainbow trout, chinook salmon, carp, long fin smelt, tench, pumpkin seed, and smallmouth bass. From Shepard's data and other literature, it is established that many of the species of fish captured use the shallow water areas in Pontiac Bay. There were indications that Pontiac Bay is used for spawning and rearing of young fish, as well as a habitat for several species of adult fish. Several migratory species were found in the area, before their migration to various creeks and streams in the Lake Washington watershed.

Extremely small numbers of fish were captured from mid-January through mid-April. During this period, Shepard reported good evidence of an offshore movement of the abundant resident species. And the abundant migratory species, including sockeye, coho and chinook salmon, were at spawning grounds by January and not migrating through the Pontiac Bay area. No juvenile coho or sockeye salmon were captured until March in the Sand Point area. Highest numbers of fish were captured in August. Shepard identified a seasonal fluctuation of fish movement: a definite offshore movement during the fall and winter, and an onshore movement in the spring. Shepard's

TABLE 10. Fish Migration

Timing of Salmon and Searun Trout Fresh-Water Life Phases in the Lake Washington Drainage System.

CDECIEC	FRESH-WATER	MONTH											
SPECIES	LIFE PHASE	J	F	M	Α	М	J	J	Α	S	0	N	D
Summer-Fall Chinook	Upstream migration Spawning Intragravel develop. Juvenile rearing Juv. out migration												
Coho	Upstream migration Spawning Intragravel develop. Juvenile rearing Juv. out migration						20			F -			
Sockeye	Upstream migration Spawning Intragravel develop. Juvenile rearing Juv. out migration								N-				
Summer Steelhead	Upstream migration Spawning Intragravel develop. Juvenile rearing* Juv. out migration										9 = 1		
Winter Steelhead	Upstream migration Spawning Intragravel develop. Juvenile rearing* Juv. out migration												
Searun Cutthroat	Upstream migration Spawning Intragravel Develop. Juvenile rearing Juv. out migration												

<sup>\*</sup>Normally extends over a two-year period.

Source: Puget Sound Task Force, Pacific Northwest River Basins Commission, Appendix XI

findings and review of literature indicate that coho salmon juveniles and adults use Pontiac Bay during migration. Shepard noted possible beach spawning of sockeye in an area near the end of the present main runway. A number of species apparently use the Pontiac Bay area for spawning and/or rearing, including peamouth, squawfish, largemouth bass, bullhead, yellow perch, prickly sculpin and stickleback.

Plankton. Additional representatives of the aquatic food chain were surveyed in Lake Washington as early as 1911. A comprehensive limnological study was conducted in the lake during 1933-34 by Scheffer and Robinson<sup>7</sup> that described the phytoplankton (Exhibit N), zooplankton (Exhibit O), shoreline vegetation (Exhibit P) and limited benthic organisms. The authors noted that plankton was uniformly distributed over the lake. Samples taken at north point and south point showed almost identical

quantities and classes of organisms.

Of interest is the summary statement of planktonic organisms related to behavior at various times of the year.

- Blue-green algae: common in summer and fall, the warmer months.
- Diatoms: common throughout the year except in midsummer; a great pulse in early spring and a lesser one in fall.
   Green algae: in late spring, especially, and

in fall.

- Protozoa: only a few species, but appearing sporadically in large numbers in summer.
- Rotifera: several year-round species only slightly affected by changing water conditions; many other species appearing for brief periods in summer.
- Cladocera: in summer and fall, seldom in the deeper waters.
- Copedoda: Cyclops fairly uniform but seeking lower levels in summer.
- Diaptomus fluctuating with the diatom pulses and giving way to Epischura during the summer.

<sup>&</sup>lt;sup>7</sup>Scheffer, V. B., and Robinson, R. J., 1939 Ecol. Monogr. 9(1): 95-143.

#### DAYTIME AMBIENT NOISE LEVEL RANGE\*

#### LOCATION

44-52dBA (without traffic)	. Fairway Estates
52-68 dBA (with traffic)	. Sand Point Way & N.E. 79th St.
52-60 dBA (no traffic)	North shore, Sand Point (Proposed NOAA Pier Site)
35-42 dBA (without traffic)	, 8520 Sand Point Way
50-53 dBA (with traffic)	. Residence adjacent to north boundary of NSA, Sand Point
44-52 dBA (no traffic)	.Webster Point
50-56 dBA (with traffic)	. Montlake Cut, (south side) (At residence furthest east from Montlake Bridge)

<sup>\*</sup>The ambient levels were measured from 3 to 12 samplings taken approximately every 15 minutes.

• Neomysis: iii all months of the year, at depths greater than 30 meters.

Generally plankton in the lake are not abundant. On the basis of organic matter, the lake is about one-fifth the richness of a base-line lake, Lake Mendota, Wisconsin. The plankton are so distributed vertically that more than three-fourths of the total amount occur in the upper half of the water body. Scheffer and Robinson found a total of 107 species of true limnetic plankton in the lake; 72 were phytoplankters and 35 zooplankters. In general, the plankton population is similar to that of Lake Erie and Lake Superior, and unlike smaller lakes in the Puget Sound region. Though varying from season to season, over the last 20 years or more, the plankton complex has been shown to be stable.

In his study of Sand Point, Patten found that zooplankton had a period of increased abundance from April to October. During the November through March period, the zooplankton biomass was 1/3rd to 1/10th that of the spring and summer months.

Crayfish. Patten observed one species of crayfish which was abundant in shallow water (1-10 ft.) during summer and in deep water in the winter.

Plant Life. Periphyton and rooted vascular plants near the NOAA site were at maximum growth in spring and summer. Plant life declined at depths of 12 and 14 feet and none was observed beyond this depth. Generally plant life in the 0-12 foot zone was deteriorating by the end of September.

Benthic Invertebrates. Patten found greater numbers and species of bottom fauna around Sand Point at depths of about 10 feet rather than in deeper water. This may be attributable to water movement protection as well as food source levels. Patten trapped chironomidae at a number of stations and found an increase in numbers in the winter followed by a sudden decrease. The sudden decrease occurs as aquatic larvae emerge to become terrestrial adults. Other forms found included oligochaetes Hyallela azteca, Pontoporia affinis, Neomsis

mercedis, Pisidium sp., Planispiral and hispiral gastropods and leaches.

Summary. Considerably more biological productivity of the Sand Point area was identified in the Patten and Shepard studies than was expected, based on the existing Lake Washington literature. The silty, shallow area of Pontiac Bay remains an attractive aquatic habitat despite concentrations of petroleum residue (d above) the effects of haphazard soil and rubble disposal, and concrete abutments. Lake Washington itself is not a highly productive lake and the NOAA site does not exhibit features making it exceptional.

Fish, benthic, planktonic and plant communities all had periods of abundance centered around the summer, and lowest numbers were in the winter.

#### g. Solid Waste

Local commercial service for the disposal of solid wastes is established and adequate for anticipated NOAA Center requirements.

#### h. Sonic Quality

Information for this section is based upon noise survey studies performed for NOAA by Harris F. Freedman & Associates, 1972 and Vibracoustics, 1974.

Present sonic conditions in the Sand Point area and the Lake Washington Ship Canal have a wide range. In the Ship Canal, from Puget Sound to the Montlake Bridge, sonic conditions are set by extensive roadway and water traffic. Residential character is submerged in a basin of constant and intermittent noise sources which include vehicle traffic, small planes, helicopters, motor boats and light industry. Beyond the Montlake Bridge to Webster Point and around to the NOAA site, the dominant sonic character is residential. Noise sources are more intermittent and less significant. Traffic noise is evident; motor-driven boat noise occurs as well as noise bursts from motorcycles, lawn mowers, chain saws and lowflying aircraft. Accoustical consultants, retained by NOAA, reported ambient noise levels in the Sand Point and Lake Washington Ship Canal as shown in Table 11.

The State of Washington Department of Ecology adopted an Administrative Code (WAC 173-60) for maximum environmental noise levels on April 22, 1975. These regulations were adopted in accordance with the Noise Control Act of 1974, in order to establish maximum permissible noise levels in identified environments. An area or zone within which maximum noise levels are established is designated as the EDNA (Environmental Designation for Noise Abatement). The EDNA for a particular property is based upon typical uses, also considering present, future and historical usage as well as usage of adjacent and nearby lands. The maximum permissible sound level at a residential property boundary (EDNA) is 55 dBA. This standard applies to residences along the Lake Washington Ship Canal, Lake Washington shore and the Sand Point vicinity. The maximum permissible noise level near a recreational facility such as the proposed city park is 57 dBA. During the hours of 10:00 p.m. through 7:00 a.m., noise levels must be reduced by 10 dBA. Noise ceilings of 60, 65 and 70 dBA are set for periods of 15, 5 and 1.5 minutes respectively at any hour of the day or night.

There are a number of exemptions to maximum permissible noise levels, although these do not preclude installation of the best available noise abatement technology consistent with economic feasibility. Sounds originating from temporary construction sites as a result of construction activity are exempt from noise standards, except when they relate to the reception of noise within residential EDNA's between the hours of 10:00 p.m. and 7:00 a.m. The Department of Ecology intends to establish regulation and/or performance standards for sounds created by construction equipment and emanating from construction sites no later than June 30, 1977. The General Services Administration has adopted restrictive construction noise regulations for urban areas specifying noise regulations to be met at 50 feet from the construction equipment. These standards are to be effective after January 1, 1975 for all GSA contractors. (See Exhibit Q.) Sounds created by watercraft are also exempt from maximum noise limitations; however, standards are expected to be established no later than June 30, 1977.

The Department of Ecology considers the function of noise abatement and control to be primarily the role of local government and encourages the adoption of measures for noise abatement and control. In September 1973, a Citizen's Task Force proposed a noise ordinance for the City of Seattle. Recommendations of the Task Force, various city and county ad hoc committees and State regulations have been incorporated into a joint city-county noise ordinance issued in May 1975. Implementation is

scheduled for late 1975. The city-county ordinance is, with few specific exceptions, identical in intent and effect to State noise regulations. However, it does differ significantly from the ordinances recomended by the Task Force and various city and county citizen's committees. Noise regulation levels for watercraft and construction activities as discussed in the DEIS were not proposed in the joint ordinance.

#### i. Energy

Electrical. NOAA estimates that a maximum of 10,000 kilowatt hours per day electrical energy would be required for the proposed facility. The City of Seattle Lighting Department advises that this demand could be met with presently available resources.

Heating and Cooling. The proposed facility will require a new heating and cooling system. Estimates of feasibility for heating energy indicated that an oil heating furnace system would be preferable. Recent oil cost increases and shortages indicate a need for a reassessment of these estimates at the time design work is completed.

Vessel Fuel. Fuel for NOAA vessels is usually purchased through U.S. Navy contracts. Availability of fuel from this source will vary with allocations and priorities affecting the Navy in this region.

#### Conclusions

The balance sheet for natural conditions at the NOAA site has as its reference standard the pre-aviation conditions of the site. Against this standard, the air, sonic and water quality of the site may not be dramatically different from previous conditions; yet they could be enhanced. As for the site's aquatic biota, soil and vegetation and wildlife conditions, they are apparently below pre-aviation circumstances and improving only slowly, if at all. In terms of potential for improvement, shoreline soils and vegetation seem the most promising. A large, diverse wildlife population seems least likely to be reestablished or improved on the site because of the urban context of the area and the demands to use the site for human purposes work against wildlife habitat development and improvement.

#### 3. Social Conditions

Information for this section is based upon studies performed for NOAA by Community Development Services, Inc., Seattle. The sociological circumstances in areas adjacent to the NOAA site are most practically described in terms of the residential "neighborhood" which is defined as the geographic unit in which everyday conveniences are shared by most of its inhabitants. An additional "neighborhood" indicator is that area in which there is significant person-to-person contact, and residents there recognize and share a sense of geographic place and social

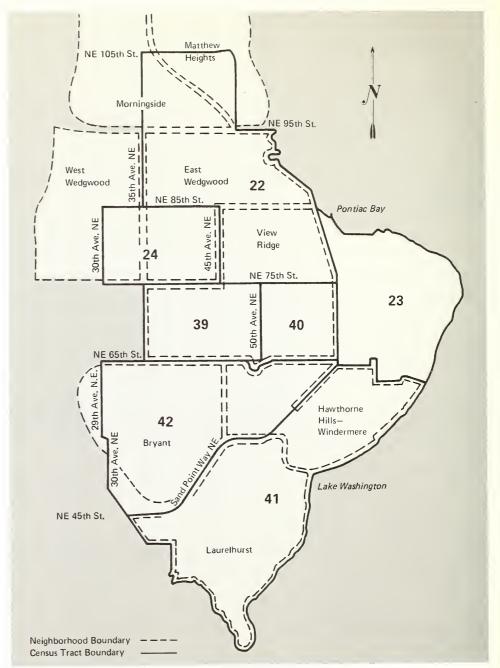


FIGURE 18. Large Study Area

cohesiveness. Based on these considerations, the relevant community adjacent to the Sand Point site extends from the Lake Washington Ship Canal north to NE 105 Street and from 35th Avenue NE east to Lake Washington, including the residents of Naval Support Activity. This area includes the following neighborhoods as designated by the City of Seattle, Department of Community Development: East Wedgwood, View Ridge, Hawthorne Hills, Windermere, and parts of Bryant, Laurelhurst, Morning Side, and Matthew Heights. (See Figure 18.)

#### a. Sociological Overview

The 1970 census recorded a population of 1,159,375 for King County with a popula-

tion of 530,831 in Seattle. Seattle is the major city of the Pacific Northwest. Portland, Oregon (382,619), 171 miles to the south; Tacoma, Washington (154,481), 30 miles south; Spokane, Washington (175,516), 278 miles east are the only other northwest U.S. cities exceeding 100,000 population in 1970. (See Table 12 for Study Area Population.)

Scattle's "central area" is not concentrated around the central business district but is generally situated to the east of it. Twenty "critical" neighborhoods, those with high indices of social disorganization and physical decay, include not only eight central area neighborhoods but also others throughout the city. Only the northeast

TABLE 12. Population of Study Area

Census Tracts	APRIL 1, 1970	PROJECTED 1990	NET PROJECTED INCREASE
22	5,863	6,163	300
23	200	255	55
24	3,129	3,013	-116
39	3,428	3,196	-232
40	1,853	1,621	-232*
41	8,370	8,784	414
42	7,615	7,930	315
Total Study Area	30,458	30,962	504
Total Seattle	530,831	534,000	3,169

<sup>\*</sup>Projections apparently do not reflect recent apartment and condominium developments.

Source: City of Seattle Department of Community Development Breakdown of Puget Sound Government Conference: Population Projections for the City of Seattle 1970-1990.

TABLE 13. Employment in King County and NOAA

		•	
CATEGORY	1970	1974	1975
Total Employment	420,900	478,000	508,700
Manufacturing	97,900	99,600	103,700
Nonmanufacturing	323,000	379,200	405,000
Total Government	78,900	91,500	96,000
Federal Employment	10,300	14,000	14,700
NOAA*	612	620	1,000

<sup>\*</sup>NOAA Components to be relocated at Sand Point.

Source: Washington State Department of Employment Security and NOAA.

quadrant has none. But overall, Seattle has virtually no high-density tenement house slums, in the classic sense.

Immigration to Seattle has included many from Southeast Asia. These visually apparent minorities have encountered difficult acculturation processes, yet these difficulties have been continually reduced. More recent arrivals, Blacks, and Chicanos, have found acceptance into the area's social structure more arduous. Again, these difficulties, sanctioned by no one but sustained by many, are continually decreasing. American Indians, the first settlers of the area and a still visible minority in Seattle, have shared the difficulties of other minorities, but they too are progressing in group esteem, individual selfidentity and, overall, to a more secure position in the region's social fabric.

Migration corridors have directed the earlier Scandinavian minorities toward the northwestern part of Seattle and Italians and Asians toward the southeastern part. But, when upward mobility has presented a broader choice of residential location, so-called ethnic enclaves have dissipated. Apart from this, but similar in effect, population growth itself has sent people out of the inner city to seek more appealing residential circumstances. Both of these movements have spurred the development of the Sand Point area so that it falls short of resembling a suburb, yet it cannot easily be defined as an inner city residential area

The Seattle area is generally affluent in

terms of its recreational resources. Nearly 30 percent of all the State's outdoor recreational opportunities lie within the central Puget Sound region. The diversity of recreational resources ranges from one of the Nation's finest local park systems to unrivaled Mount Rainier National Park. The region has 1,685 lakes, including Lake Washington. There are 800,000 acres of National Forest, 220,000 of which are classified as wilderness. There are nearly 4,000 miles of trails and over 700 "hiking" Alpine lakes. Three of the State's major skiing complexes are within or adjacent to the region. Salt and fresh water boating activities are conspicuous in the area, with a wide range of fishing opportunities close at hand.

The region's 1,937,000 persons represent 56 percent of the State's population. However, residents of the region accounted for 62 percent of all recreation "activity occasions" for State residents.

#### b. Sand Point Area Characteristics

This area has many characteristics of American suburbia, but they are tempered by the influences of the University of Washington, and to a lesser extent, by the former Sand Point Naval Air Station. Thus if there is flavor of middle class, middle American "conservatism" in the area, there is at the same time a high presence of intellectual "liberalism." Progressive attitudes in the community may be a fairer and more inclusive description.

A significant proportion of Seattle's affluent and intellectual leaders reside in the area. Community stability is a hallmark. In 1974, 57.5 percent of the residents lived in the same house as in 1965; 80.9 percent of males over 16 are in the labor force. Nearly half of the employed persons are in professional, technical or managerial fields. In Windermere and Laurelhurst this figure rises to 62.7 percent; 63 percent of the families enjoy incomes over \$12,000 per year; 30 percent earn from \$15,000 to \$25,000.

For the most part, these socioeconomic characteristics are homogeneous throughout the Sand Point area. An exception is found in the University of Washington student housing project at the southwest boundary of the Naval Support Activity. Compared to the city at large, fewer 65 and older people live in the area, though the median age is higher than the city average. This suggests that many families are at the stage where children have left home. A significant number of homes are for sale or have recently changed owners, a trend that will return more children to the area.

A sense of place and of home and of maintaining or improving the residential atmosphere of the area is characteristic. Volunteer community clubs here are probably more active than in any other section of the city. A large number of the residents are willing to devote time and energy to the resolution of larger public policy issues as well as to more limited community concerns. At least five community clubs are active: Hawthorne Hills, Inverness, Laurelhurst, Belvedere Terrace and View Ridge. These groups are most effective as forums for examining issues and mobilizing support for or against a particular position. Exhibit R lists the basic information referred to in this discussion.

#### Conclusions

Socioeconomic trends in the Sand Point area appear to meet or set the standard for living in Seattle. Progressive attitudes, attention to living quality, a general sense of civic responsibility, enjoyment of leisure and recreation, and an awareness of community identity seem reasonable descriptors of the Sand Point area residents. New people to the area will probably meet this standard rather than alter it, and new developments such as the NOAA Center will be required to be similarly complementary.

#### 4. Economic Conditions

Information for this section is based upon a study for NOAA by Bill Grinstein, Economist, Economic Development Council of Puget Sound, Seattle.

#### a. Current Economic Activity

NOAA and predecessor agencies have been operating at fairly constant levels of employment from 1970 to 1974. This is shown in Table 13 which also shows employment by

TABLE 14. Projected Employment, King County and NOAA

CATEGORY	1980	1990
Total Employment	474,950	611,379
Manufacturing	116,713	136,056
Nonmanufacturing	358,237	475,323
Government (Total)	94,400	98,175
Federal Government Only	14,160	14,730
NOAA	1,273*	1,400

<sup>\*</sup>Excludes expected cafeteria/auditorium employees (10).

Source: Puget Sound Governmental Conference Preliminary IRDP Forecast Model JT7-1/29/74 and

TABLE 15. Future NOAA Activity Levels

	FY-75	FY-76	FY-81
Employment	687	1,000	1,273
Budget	\$17.65 mil.	\$32.8 mil.	\$40.84 mil.
Space	121,305	144,533	457,500
(square feet)			

Source: NOAA estimates.

general category in King County.

NOAA's fiscal year budget for the State of Washington was just under \$23.6 million of which approximately \$15 million involved NOAA organizations proposed for collocation at Sand Point. The payroll for these organizations approximates \$8.9 million. NOAA expenditures in the Seattle area grew significantly in 1975 to over \$32 million. NOAA employment in the Seattle area increased to 1,000 persons in 1975.

#### b. Future Activity

NOAA anticipates increased activities in the region through 1990, assisted by new headquarters which can accommodate the future growth. Table 14 identifies the projected employment for both NOAA and King County for the years 1980 and 1990.

The increase for NOAA forecast for 1980 and 1990 indicates employment growth in NOAA at the same rate of growth of employment generally. Table 15 summarizes the estimated FY-75, estimated FY-76 and FY-81 projected employment and budget and space needs at Sand Point.

c. NOAA Space Requirements and Associated Costs

Currently, NOAA leases space for its operations. Expansion potential at these leased sites is not available. Estimates have been made of current space utilization by function, associated lease costs and projections of lease costs based on FY-75 square foot lease costs. These estimates are shown in Table 16.

Based on a forecast of NOAA employment of 1,400 in 1990 and 1,500 in the year 2000, additional space requirements in these years were calculated. Utilizing the average square foot lease costs projected for 1980 (\$4.79 per sq. ft.), estimates of annual lease costs for 1990 and 2000 were made and are shown in Table 17.

The estimates in Tables 16 and 17 may then become the basis for comparison of the estimated stream of future lease payments to construction cost estimates for the Sand Point site. All costs are in 1975 prices.

Calculations to make these comparisons assumed a 60-year useful life (the time generally applied by GSA to new building

TABLE 16. Estimated Future Lease Costs (Activities to be collocated at Sand Point)

		1975 (	FY-76)		1980 (FY-81)			
ORGANIZATION	PERSON- NEL	SPACE (SQ.FT.)	COST (SQ.FT.)	TOTAL COST	PERSON- NEL	SPACE (SQ.FT.)	TOTAL COST	ADDITIONAL LAB SPACE
Northwest Administrative Service Office	61	12,345	\$8.83	\$108,985	105	21,200	\$187,600	_
National Marine Fisheries Service	44	15,385	4.03	62,133	112	43,000	187,800	3,700
Coastal Zone and Estuarine Division								
Marine Fish and Shellfish Division								
Northwest Regional Office								
Marine Mammals Division	37	8,348	1.95	16,000	40	11,800	39,700	2,800
Pacific Utilization Research Center	35	7,200	2.86	20,600	50	25,300	149,470	15,000
Office of Scientific Publications	12	3,225	7.48	24,120	15	4,000	30,200	_
National Weather Service Forecast Office	33	7,605	8.89	67,589	49	11,300	100,400	_
National Ocean Survey								
Pacific Marine Center								
Shore-based	80	35,160	6.23	218,920	576	210,000 <sup>1</sup>	700,000 <sup>1</sup>	1
Ship-based in Port	576							
Northwest Regional Calibration Center	6	5,400	2.85	15,400	11	9,900	28,200	_
Environmental Research Laboratory								
Pacific Marine Environmental Laboratory	79	9,585	4.68	44,900	128	27,800	175,700	12,300
Marine Ecosystems Analysis	1	200	6.00	1,200	16	3,200	19,200	_
Education Center	36				60	90,000	572,400	_
(Students)	(170)	40,000	6.36	255,000	400			
TOTAL	1,000	144,553		\$834,847	1,273 <sup>3</sup>	457,500 <sup>2</sup>	\$2,190,670	33,800 <sup>4</sup>

<sup>&</sup>lt;sup>1</sup>210,000 sq. ft. to include:

Source: NOAA

<sup>80,000</sup> sq. ft. open storage @\$1.00/ft.

<sup>70,000</sup> sq. ft. covered storage @\$2.00/ft.

<sup>60,000</sup> sq. ft. office, lab and shop space @\$8.00/ft.

<sup>&</sup>lt;sup>2</sup> Average sq. ft. lease cost in 1980 would be \$4.79/sq. ft.

<sup>&</sup>lt;sup>3</sup> Cafeteria/auditorium employees not included.

<sup>&</sup>lt;sup>4</sup> Additional lab space required for expected new employees @\$8.00/ft.

construction) and a discount rate of 5-5/8 percent, the rate currently used by the Army Corps of Engineers for benefit-cost analyses. The 1980 rental of \$2,190,670 was considered to be the average for 1975-1990, the 1990 rental of \$2,411,000 for the years 1990-2000, and the year 2000 lease cost of \$2,582,000 for the years 2000-2035. The calculations are summarized in Table 18.

Table 19 compares the present value of future lease costs in constant 1975 dollars (as derived in Table 18) to the present value of construction costs projected for Sand Point as expressed in the Preliminary Program of Facility requirements prepared for NOAA in 1976 by the Ralph M. Parsons and John Graham companies. Based on the comparison in Table 19, the present value of construction at Sand Point is materially less than the present value of continued leasing, both in terms of comparable facility requirements and the expanded facilities the Sand Point site allows.

#### Conclusions

NOAA facility consolidation at Sand Point and the trend of federal policies toward environmental conservation activities could be a catalyst for considerable NOAA program growth. Present employment levels of about 1000 could increase to almost 1300 in 1980, reaching a possible 1400 by 1990.

TABLE 17. Estimated Lease Costs

	1990	2000
Employment	1,400	1,500
Average cost per square foot	\$4.79	\$4.79
Square feet required	503,200	539,100
Annual costs	\$2,411,000	\$2,582,000

Similarly, present budget levels could be expected to increase to over \$40 million a year from \$32 million at present. The context of this growth in the Seattle area, a continuing concern about unemployment and a slowly changing regional economic base, makes the NOAA Center especially significant to the economic welfare of the Northwest. Apart from these regional economic circumstances, there are pressing matters of efficiency and productivity within NOAA components in Seattle. Nine of NOAA's Seattle area facilities are in leased space in seven separate locations. (See Table 1.) Adequate efficiency and productivity of these components can be achieved only with great difficulty in these circumstances. Considerable cost savings to NOAA can be achieved in a consolidated facility. (See Part

#### 5. Visual Conditions

Information for this section is based upon a study for NOAA by Ted Bower, A.I.A., Seattle.

#### a. General Site Description and Topography

The Sand Point Peninsula and adjacent terrain comprise a clearly defined visual district, one of the most prominent locations in the Lake Washington basin. (See Figure 19.)

Sand Point is surrounded half by water and half by higher landforms to the south and to the west. The nearby west hills form much of the visual horizon for the NOAA site, but on a clear day the east horizon is the Cascade Mountain range, some 40 miles away.

From a distance, the peninsula appears to be dead flat. But seen from the south or north ends of the runway, a subtle rise to a center crown near the southern border of the NOAA site is quite apparent. The high

TABLE 18. Present Value of Future NOAA Lease Payments

	ANNUAL LEASE COSTS	DISCOUNT RATE	TOTAL LEASE COSTS	PRESENT VALUE
1975-1990	\$2,190,670	5-5/8%	\$32,860,000	\$21,807,800
1990-2000	2,411,000	5-5/8%	24,110,000	7,945,400
2000-2035	2,582,000	5-5/8%	90,370,000	9,867,000
T0TAL	_	_	\$147,340,000	\$39,619,000

TABLE 19. Comparison of Present Value of Lease Costs to Construction Costs at Sand Point

Present Value - Lease Costs 1975-2035
Present Value - Capital Costs at Sand Point
(total facility in 1975 constant dollars)
Present Values Capital Costs at Sand Point
Less Facilities not currently leased*

<sup>\*</sup>Visitor facilities, auditorium, food service facilities, mechanical support facilities, health services, aquaculture facilities.

point of the crown, in the vicinity of the present control tower, is about 18 feet higher than the shoreline.

To the west, View Ridge rises sharply to a maximum of 360 feet at the View Ridge School. The ridge descends abruptly to the north from Sand Point Country Club through Inverness into the Thornton Creek watershed. To the south, the ridge falls off gradually into Hawthorne Hills. Sand Point Way N.E. and the Burke-Gilman Trail enter the district on the swale between Hawthorne Hills and the 220-foot high rounded hill which indentifies the Windermere neighborhood. Thus, the NOAA site is clearly delimited topographically from Windermere to Hawthorne Hills to View Ridge, to Sand Point Country Club, the new Fairway Estates Condominium and to Matthews Beach. The lakefront at Matthews Beach Park is about 4,500 feet from the NOAA site, beyond the range of major visual impact. (See Figures 20 and 21.)

The maximum elevation of the NOAA site reaches 25 or 26 feet in its southeast corner and at the old airfield control tower, and slopes evenly from these areas to the lakeshore which is typically two to five feet above water level.

The same flat terrain extends west of the NOAA site to approximately the approach to the NSA north gate, then rises about 30 feet in a sharp bank to the elevation of Sand Point Way N.E. which extends almost level on a narrow bench above the former airfield and at the foot of the slope of View Ridge and Aviation Heights.

View Ridge and Aviation Heights have developed as desirable residential areas partly because of sloping terrain which enables houses on most lots to enjoy views of Lake Washington, east shore suburbs, and the Cascade mountains. This hillside is not uniform as to gradient, but slopes 19 to 21 percent are typical, and sharp slopes of up to 50 percent occur in spots. A slope of 20 percent from each lot to the next below makes it reasonably sure that a series of houses can have spectacular views, and any increase in slope amplifies the panorama. Two ravines cut sharply into the east slope of the View Ridge landform, dividing it into separate enclaves. One extends west from the Sand Point Arms on Sand Point Way N.E. up into Sand Point Country Club north, and between the two ravines is the main Aviation Heights enclave, with N.E. 77th Street as its only access from Sand Point Way. Aviation Heights is the residential area closest to the NOAA site. A topographical profile sketch, Figure 22, shows the visual relationship of Aviation Heights residences to the NOAA site.

Both ravines are very narrow and have some slopes of up to 75 and even 90 percent. Land in the south ravine was purchased by residents and dedicated as open space for the residents of Aviation

Heights. The north ravine has been part of the Sand Point Country Club property and is currently being developed as part of the Fairway Estates condominium enclave which directly overlooks the proposed NOAA pier development.

#### b. Natural Lighting

There are striking differences in the characteristics of natural light between the NOAA site and the east slopes of View Ridge and Aviation Heights. The size of the relatively flat and open Sand Point peninsula (about 4,400 feet north-south and 3,800 feet east-west) exposes it and the NOAA site to a practical maximum of available sunlight and daylight. Even nearby View Ridge, about 350 feet higher than the airfield, rises no more than 5 or 6 degrees above the visual horizon when viewed from the middle of the NOAA site (Figure 23).

In contrast the View Ridge slope is a "morning place." It receives sunshine in the morning and most of its daylight from the eastern half of the sky. Obstructions, shadows from trees, and other houses temper the

light from the western half of the sky and the intensity of sunlight begins to decrease relatively early in the afternoon. This difference is further accentuated by the east orientation of the dwellings on the View Ridge slope. Thus, in the late afternoon in spring and summer, the NOAA site receives sunshine as much as an hour after many of the sites on the View Ridge slope are in shadow.

#### c. Land Coverage, Density, Grain

The coverage in single-family residential areas is typical in zones having 5,000 square feet minimum lot sizes and might be characterized as "fine grain" compared to the coverage in the north sector of the Naval Supply Activity where single hangar structures exceed 80,000 square feet. Centered generally on Sand Point Way N.E. lies an intermediate zone as to scale and grain of development which includes the NSA residential buildings south of the Main Gate as well as the recent apartment and condominium developments on the west side of the arterial, the Sandpointer, Park Point, the

7001, and Fairway Estates. The Burke-Gilman Trail serves generally as a boundary between the fine-grain, single-family areas and the other types of development.

#### d. Streets and Open Spaces

The Sand Point district is on the edge of the large open space of Lake Washington. The inactive airfield is the largest open land area. Other open spaces include the private golf course at Sand Point Country Club, the wooded ravine south of Aviation Heights and the scattered parcels of undeveloped land. The former Burlington Northern Railroad right-of-way, planned to become the Burke-Gilman hiking and biking trail, is the potential artery which might connect various parks and public open spaces to form a linear system.

The street network, as is common in urban areas, serves also as an open space network, and because of topography there is some clear differentiation between arterial and neighborhood streets in the Sand Point district.

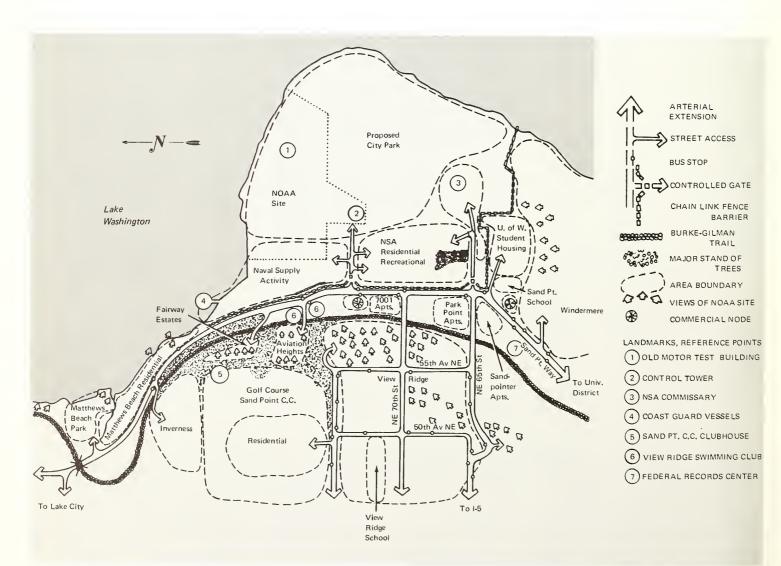


FIGURE 19. Visual Organization of Sand Point and Environs

#### e. Visual Character of Existing Development

NOAA Site. About 70 percent of the site is paved and sloped gradually north to shoreline. (See Figure 3.) Hangars 1, 32 and 33 are owned by NOAA. The dimensions of Hangars 32 and 33 are 360 feet north-south, 240 feet east-west, and 50 feet maximum height. They are enormous structures built in 1939, with wall sheathing of gray corrugated asbestos and east and west facades made up entirely of 32-by 32-foot gray steel rolling doors with large steel window panels set about 9 feet off the ground. North and south facades show four-storied stair towers

at all corners connected by lower two-story structures having small regularly spaced double-hung windows on both floors.

Building 1 is smaller, 300 by 160 by 37 feet high, and was built earlier, in 1928. It is also unobtrusively gray except for the two-story office block on the north side which is painted white and which is a major landmark seen from both the east and west lakeshores as far as two miles north because it is white and because it fronts on the north shore of Sand Point.

Naval Support Activity Site and Buildings. The existing buildings at the Naval

Beyond Visual Impact Zones 1 and 2 there is zero visibility of the NOAA site from Kenmore almost all locations in Seattle. Distant views of the NOAA site are mostly from Lake Forest across Lake Washington. Park Miles Sheridan Beach KFY  $\bigcirc$ Seattle City Limit 1 2 major to moderate moderate to zero NE 125th O.O. Denny Park (3)(2)Juanita Bay Matthews Beach Waverly Park Beach Views of (3) Cascade Range NOAA NE 75th Marina Park NE 70th Kirkland NE 65th (2)(3) Lake Washington Houghton Beach 1 Mt. Rainier Laurelhurst **Hunts Point** (3) Yarrow Fairweather Union Bay Point Point Floating Bridge

FIGURE 20. Visual Impact Zones

Support Activity, which will be NOAA's closest neighbor, exhibit several strains of architectural character. The two major types might be called "asbestos-industrial" and "red brick post office colonial," both circa 1935.

#### f. NOAA Site and Environs at Night

The unused air field and the nearest Navy buildings are generally unlighted. The residential slopes of Aviation Heights and View Ridge are densely scattered with lighted windows; the wooded unbuilt ravine areas are dark, and the lake is dark.

Across the lake the Kirkland central district is a brilliant cluster of lights, and there are sparsely scattered lights over all the slopes north to Kenmore and south to Evergreen Point and beyond. This varying distribution of street lights and house lights around the lake basin expresses more sharply than the daytime panorama the suburbanization of the lake basin. To the west the lights of Sand Point Country Club are apparent and below the clubhouse are the 84 condominium units of Fairway Estates, now under construction. The Fairway Estates development overlooks the NOAA site more directly than any other residential area at night and its presence will increase dramatically the urban quality of the visual environment.

#### g. Views of NOAA Site

NOAA from O. O. Denny Park. Although Sand Point is about 1.4 miles south-southwest across Lake Washington, it is a major feature of the view from O. O. Denny Park because it presents at least two contrasts to the rest of the Seattle lakeshore. First, it reads broad and flat and just above water level in contrast to the well-planted residential slopes behind it extending from Windermere to Matthews Beach. It also is largely free of visible structures for most of its expanse to the east. The second contrast is to the character of the Navy structures clustered at the west edge of Sand Point at the foot of View Ridge. The hangars and some of the other buildings are very large volumes, appear to be tightly grouped, and are unrelieved by tree plantings. A cluster of tiny vehicles far south near one of the buildings reflects the sun and helps to give scale to the very large volumes of the hangars. Beyond and behind the vast flat airfield can be seen the densely landscaped landforms of Evergreen Point and Mercer

NOAA from Three Kirkland Parks. The Sand Point peninsula and its environs on the west shore of the Lake were observed from Houghton Beach, Marina Park (in downtown Kirkland), and Waverly Beach north of the town center. The nearest point of the NOAA site is about 2.5 miles distant from Houghton Beach, 2 miles distant from Marina Park and 1.4 miles from Waverly Beach. Viewed head-on from these locations the flat terrain

of the airfield is not noticeable as a distinct landform.

The large volumes of the hangars, the recreation building, and the barracks stand out in contrast to the fine grain texture of the landscaped residential districts above the slopes of View Ridge and Windermere.

#### Conclusions

Existing visual conditions of the NOAA site

and its environs are characterized by strong contrasts. The flat land against the lake expanse; the abrupt rise to the hills on the west and south from the concrete surface of the site; and the developed neighborhoods and Navy facility with their activity, trees and streets all heighten the appearance of disuse and foreign development on the NOAA site. On the airfield itself, visual means to measure size and distance are

nearly absent; there is no basis for sensing human scale. Development of the site by NOAA can create beneficial visual relationships with other elements of the environs by introducing buildings which are well-designed and well-related to NOAA piers and vessels, by providing landscaping harmonious with surrounding hillslopes and by arranging visual compatibility with the existing Navy buildings.

#### 6. Land Use Conditions

Information for this section is based upon a study performed for NOAA by Diana Bower, Community Planning Consultant, Seattle.

Land use has been examined at three geographic levels. The first is within the NOAA site itself; the second in terms of the immediately adjacent uses; and the third in terms of the larger study area bounded by N.E. 105th Street on the north, 35th Avenue N.E. on the west, and by Lake Washington on the east and south.

The present circumstance of the NOAA site is outlined in Part III. "The Proposed Actions". Immediately adjacent areas are the Naval Support Activity on the west and the remaining part to the south, which is to be converted to park and recreation uses. Across Sand Point Way N.E. to the west of NSA is a strip of multifamily residential development. South of NSA is a cluster housing development for married University of Washington students and their families. To the southeast, portions of an established residential community, Windermere, abut the airport land.

The larger study area, comprising eight neighborhoods (described in Figure 18), is used almost entirely for single-family residential purposes. There is some strip commercial development along major arterials. There are five public elementary schools, four private schools, a regional children's hospital, thirteen religious institutions, three recreational clubs and three public playgrounds or parks. (See Figure 24.)

#### a. Land Use Change Trends

The study area shows a growth of multifamily residential dwellings, especially along Sand Point Way N.E., west of NSA. From 1960 to 1970, there was an increase of 607 multifamily units; and from 1971 to 1973 an increase of 233 units occurred. New single-family dwellings have been added as well, but this increase has not been so localized nor so dramatic. Between 1960 and 1970, 585 new single-family dwellings were added; and from 1971 to 1973 only 89 new single-family dwellings were added.

#### b. Vacant Land

The larger study area has some 500 vacant building sites. Most of this buildable land is in the East Wedgwood and lower View Ridge areas west of Sand Point Way N.E. It is in

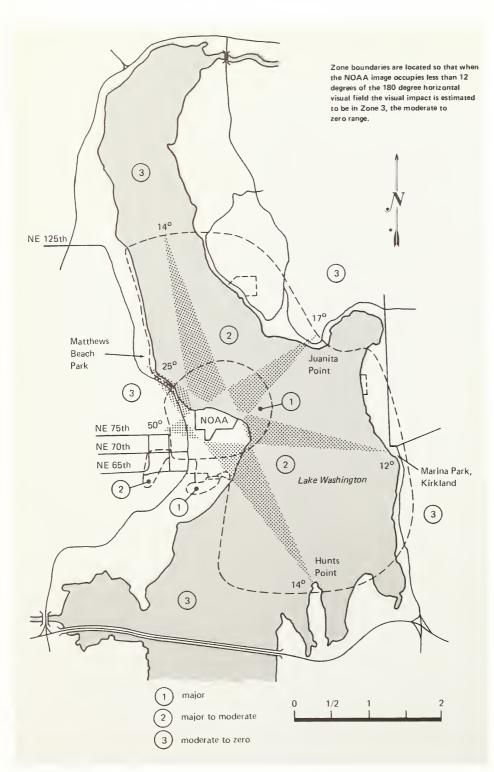


FIGURE 21. Horizontal Scope of NOAA Site Image from Selected Viewpoints

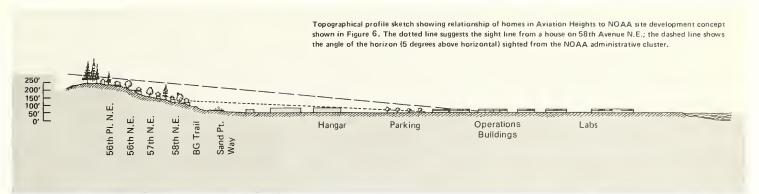


FIGURE 22. Topographical Profile Sketch

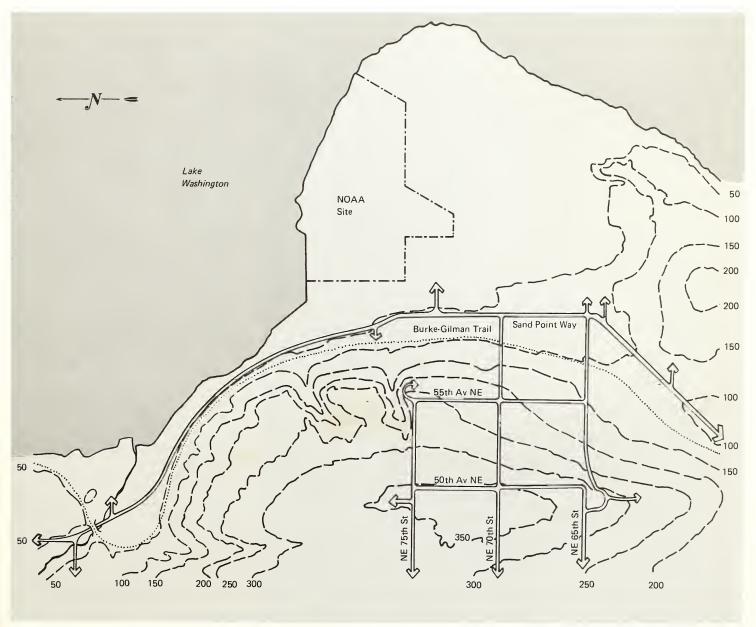


FIGURE 23. Topography of Sand Point Environs

these areas that many new multifamily units have been built in recent years. The available land and present building patterns suggest a sustained dominance of the residential character of the area.

#### c. Park and Recreation Development

For some time City of Seattle planners have noted that this quadrant of the city is deficient in park and open spaces. With the probable development of a 212-acre park on Sand Point and the development of the 9.5-mile Burke-Gilman Trail on the old Burlington Northern right-of-way west of Sand Point Way N.E., there will be a dramatic addition to public recreation resources and public open space. This contribution to the present land use fabric buttres-

ses further the residential character of the area.

#### d. Relevant Land Use Policies

Federal Land Use Policies. The Federal Urban Land Use Act, codified as 40 USC 531-533, states that disposal or change of use of Federal lands in urban areas "shall, to the greatest extent practicable, be consistent with zoning and land-use practices and shall be made to the greatest extent practicable in accordance with planning and development objectives of the local governments and local planning agencies concerned." A part of the proposed NOAA Center may fall within the purview of the Coastal Zone Management Act of 1972, if Lake Washington is defined as within the State's coastal zone. Section

307(c) (2) provides that "a Federal agency undertaking any development project in the coastal zone shall conduct and support those activities in a manner which is. to the maximum extent practicable, consistent with approved State management programs." Section 307(c) (3) of the Act stipulates that applicants for Federal licenses or permits must provide to the licensing agency a certification that their activities will be conducted in a manner consistent with the State's coastal zone management program. At this time the State of Washington does not have an approved management program, but it is possible that such a program will be effective before the NOAA Center is developed. In the interim, standards and policies of the State's Shoreline Management Act are a guide to relevant local land use policies.

State and City Land Use Policies. The State Shoreline Management Act of 1971 delegates to the City of Seattle the responsibility for planning future uses of the shorelines and for issuing permits for construction-related activity of a substantial nature. Issuance of any permit is guided by the required Master Program of the City of Seattle. At this time, the Master Program is being developed and may be adopted and in effect before construction work on the NOAA Center begins.

Development of the Master Program has relied on recommendations of the Seattle Citizens Shoreline Advisory Committee and the recommendations of the Lake Washington Regional Citizens Advisory Committee. The Seattle Committee recommended a system of priorities for future development on shorelines. They are:

- Protection and enhancement of natural areas or systems
- Water dependent uses
- Water related uses
- Non-water related uses
- Prohibited uses.

Among those listed as water dependent uses was "marine and limnological research and education." The Regional Committee recommended as a primary and fundamental goal for Lake Washington that "the natural amenities and resources of Lake Washington are to be conserved in a predominantly recreational-residential environment with adequate access available to the public."

Zoning. The entire Sand Point peninsula is presently zoned RS7200. The remainder of the study area is largely single-family residence zoning, RS9600 to RS5000. In residential zones research and educational activities are permitted as a conditional use. A small amount of RM (multifamily) and business zoning occurs along arterials. (See Exhibit S.) The City's Comprehensive Plan for the site is depicted in Exhibit B.

#### Conclusions

In terms of land use, the larger study area is

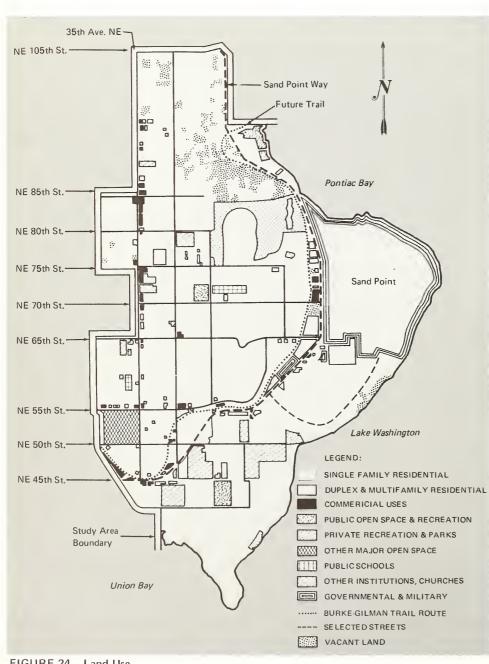


FIGURE 24. Land Use

uniformly residential with little to suggest probable change to this pattern. In support of this commitment to residential uses are ample streets and arterials and mature greenery throughout the area, as well as well-kept homes. The addition of planned recreation resources largely completes the amenity requirements for a comfortable and appealing group of neighborhoods. Federal and local land use policies require that use of the site be compatible with local environmental and development policies.

#### 7. Transportation Conditions

Information relating to existing and future transportation conditions is based on preliminary studies by R. A. Parker, Inc., Seattle and analyses and recommendations prepared by Tudor Engineering Co., Seattle.

#### a. Vehicular Circulation System

Figure 25 indicates all major, minor and residential arterials and streets in the area of Seattle east of Interstate 5, north of the Lake Washington Ship Canal, south of N.E. 145th Street (the northern border of the City of Seattle), and west of Lake Washington. Presently, two limited access facilities are in this area. Interstate 5 on the western edge of the map is the major north-south interstate access to the city. State Route (SR) 520, coming from the east and joining Interstate 5, is a major access to the east side of Lake Washington and forms the roadway of the Evergreen Point Floating Bridge across the lake. A third limited access facility is currently in the planning stages, SR 522, which will follow the approximate route of Lake City Way, a major arterial to the west and north of Sand Point. Current plans for this corridor call for an upgrading of Lake City Way, with some access limitations. However, the tentative development schedule for SR 522 does not specify construction until 1978 at the earliest, with completion no sooner than 1981.

There are several major and minor arterials in the Sand Point area, Sand Point Way N.E. extending from N.E. 45th to N.E. 125th Street, passes directly in front of the site. It is a major arterial from N.E. 45th to the northernmost tip of Sand Point, where it becomes a two-lane arterial. Other nearby major arterials are Lake City Way, going from I-5 at N.E. 75th Street on to Bothell, and the one-way street systems of Roosevelt Avenue N.E. and 11th Avenue N.E., whick extend from the north end of the University Bridge over the Lake Washington Ship Canal just to the west of the University of Washington, up to N.E. 70th Street.

Minor arterials—those which permit one lane of traffic in each direction—are an important vehicle access resource to the Sand Point site. The minor arterials which lead directly to the site are:

- Sand Point Way N.E. from the northernmost edge of Sand Point proper to N.E. 125th Street;
- N.E. 65th Street, coming from I-5 to Sand Point Way N.E.; and
- N.E. 70th Street from 35th Avenue N.E. to Sand Point Way N.E.

Other north-south arterials in the area re:

- 35th Avenue N.E. from Sand Point Way N.E. to Lake City Way;
- 55th Avenue N.E. from N.E. 65th Street to N.E. 75th Street;
- 40th Avenue N.E. from N.E. 70th Street to N.E. 85th Street;

- 25th Avenue N.E. from Montlake Boulevard to Lake City Way;
- 20th Avenue N.E. from N.E. 50th Street to Lake City Way;
- 15th Avenue N.E. from the University of Washington to N.E. 145th Street; and
- Roosevelt Way N.E. is also a minor arterial from N.E. 70th Street up to and beyond Interstate 5.

East-west arterials are:

- N.E. 145th Street from I-5 to Lake City Way:
- N.E. 125th Street from Roosevelt Way N.E. to Sand Point Way N.E.;

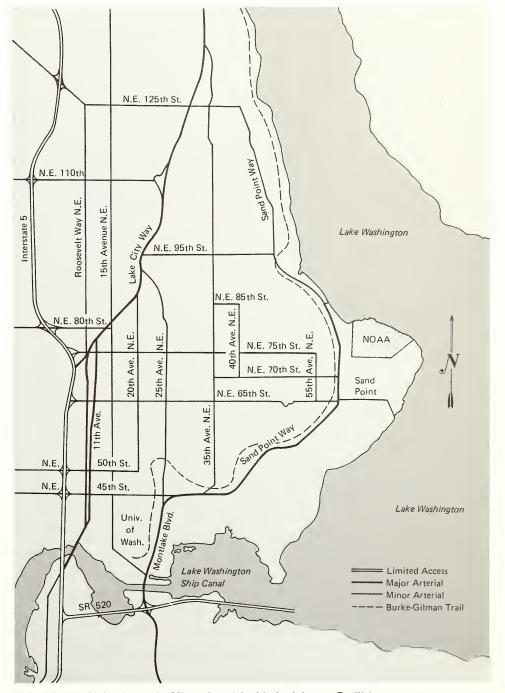


FIGURE 25. Major Arterials, Minor Arterials, Limited Access Facilities

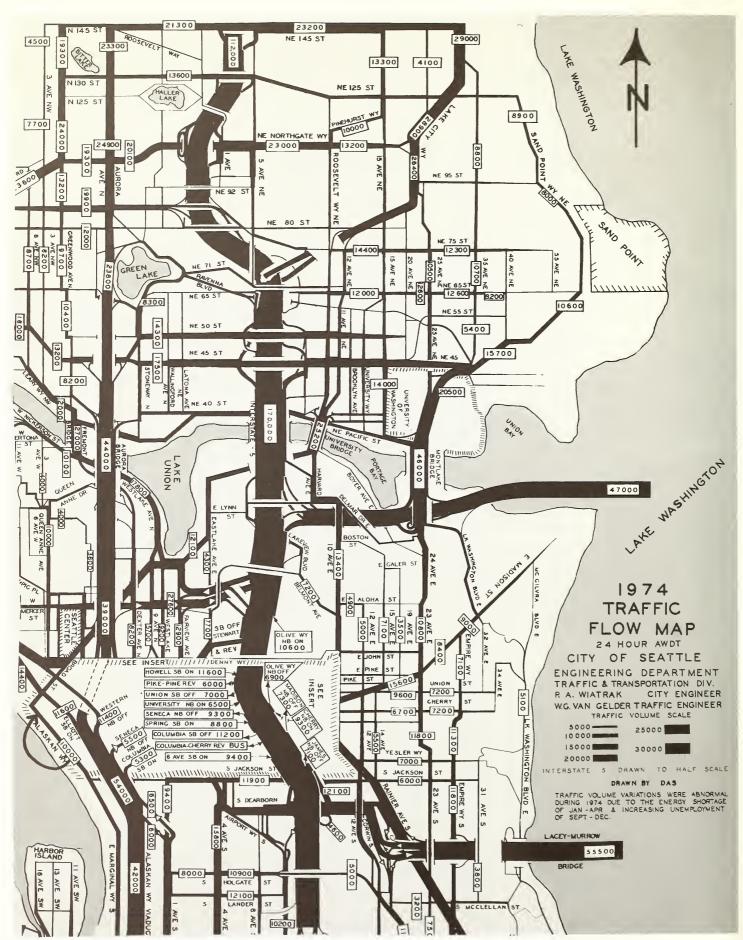


FIGURE 26. Traffic Flow Map, Sand Point Area

- N.E. 95th Street from Lake City Way to Sand Point Way N.E.;
- N.E. 75th Street from I-5 to 55th Avenue N.E.;
- N.E. 80th Street for five blocks between 35th Avenue N.E. and 40th Avenue N.E.;
- N.E. 65th Street from 1-5 to Sand Point Way N.E.;
- N.E. 50th Street from I-5 to 20th Avenue N.E.; and
- N.E. 45th Street from I-5 to Sand Point Way N.E.

The posted speed limits on limited access facilities are set at 55 mph; for major arterials at 35 or 40 mph; and for minor arterials 30 mph. Speed limits on all other streets are 25 mph unless otherwise posted.

Traffic volumes on the highway and street network are monitored by the State Highways Department and the City of Seattle. The City Engineer issues annually a map which depicts graphically the average daily vehicular traffic (ADT) on the principal routes. A portion of the 1974 Traffic Flow Map is reproduced as Figure 26. Data for certain street segments are not shown, because the traffic volume is historically low. Some low-volume streets are classified as arterials only because they serve bus lines. An example is 55th Avenue N.E., between N.E. 65th and N.E. 75th Streets.

Traffic flow in the immediate vicinity of the project was examined, using the City and State records, supplemented by surveys conducted by the Navy and Tudor Engineering Company. Figure 27 shows current ADT on Sand Point Way adjacent to the Naval Support Activity, and the traffic using the existing entrances to the Navy facilities. Traffic flow at peak periods was also evaluated. Diagrams indicating the AM and PM peak flows are represented in Exhibit T.

The traffic volumes experienced are well within the capacity of a well-aligned 4 lane arterial roadway. Consequently, the traffic moves freely, and is not obstructed by operation of the cross-street intersections. Local difficulties occur on an intermittent basis in the case of vehicles exiting the Naval Support Activity around 4:00 p.m. These difficulties arise as a consequence of the confined layout of the exit lanes, the relatively unsophisticated traffic signal control system, and the concentrated nature of the peak loading immediately following the end of working hours.

#### b. The Mass Transit System

The Municipality of Metropolitan Seattle (METRO) operates the mass transit system in and around the City of Seattle. Two routes, the Number 8 Ravenna and the Number 41 Blue Streak/Park'n Ride, operate on Sand Point Way N.E. adjacent to Sand Point. The two lines that operate on Sand Point Way N.E., the 8 and 41, are actually one bus route. A coach which is a Number 8

outbound from the central business district will become a Number 41 in the vicinity of Sand Point, and the reverse is true of a Number 41 heading inbound along Sand Point Way N.E. During non-peak-hour periods, this route operates on half-hour headways (with an additional two minutes added to the headway every hour). During the peak hours (from 6:50 to 8:30 a.m. and from 4:20 to 6:30 p.m.) headways vary from 5 to 15 minutes. All vehicles used on the 8/41 bus route are modern, 60-passenger coaches, with a possible rare exception on a local run during the peak hour when all newer coaches are in use. In such exceptions, usually an older 45- or 50-passenger coach is used. METRO has no plans in the near future to alter their present transit service to the Sand Point site.

#### c. Pedestrian, Bicycle and Bridle Path

At the present time there exist no formal pathways dedicated solely to pedestrain, bicycle or horse use. However, just across Sand Point Way N.E. is the right-of-way for the Burlington Northern Railroad line in northeast Seattle. The right-of-way has been acquired by the City of Seattle for conversion to a hiking and bicycle trail. The trail is expected to fit into a countywide trail system planned by King County officials. The tracks and ties have been removed, but little else has been done. This trail, called the Burke-Gilman Trail, is shown in Figure 24.

At the present time, there are no other firm plans to develop pedestrian ways in the vicinity of the NOAA site. The City of Seattle has a plan for a city-wide system of bicycle paths, but the only element of that plan near the NOAA site that has reached definitive stages is the Burke-Gilman Trail.

#### d. Waterways and Water Facilities

The Lake Washington Ship Canal forms the waterborne access route between Lake Washington and Puget Sound. Within Lake Washington, water access to the various points along the lakeshore is not restricted to specific shipping lanes, with the exception of the access beneath the Evergreen Point

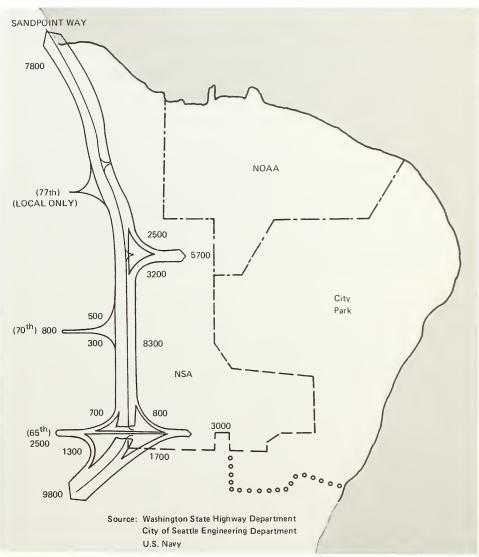


FIGURE 27. Current Average Daily Traffic on Sand Point Way and NSA Entrances (1974-75)

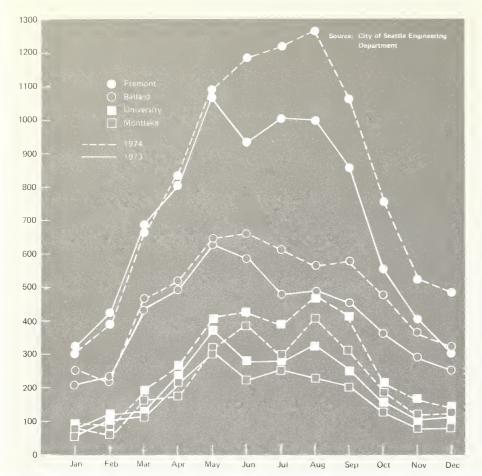


FIGURE 28. Total Openings per Month

TABLE 20. Clearances and Annual Openings for Lake Washington Ship Canal Bridges

	CLEARANCE	1972 OPENINGS	1973 OPENINGS	1974 OPENINGS
Ballard Bridge	45'	4,325	4,924	5,699
Fremont Bridge	30'	7,532	8,391	9,855
University Bridge	44'	1,956	2,356	3,265
Montlake Bridge	46'	1,495	2,008	2,592
TOTAL OPENINGS		15,308	17,679	21,411

TABLE 21. Lake Washington Ship Canal Users by Vessel Category, 1974

Small recreational boats (private)	60,752
Fishing boats (commercial)	9,995
Passenger boats (commercial)	1,128
Ships (large commercial)	93
Tugs (commercial)	7,696
Barges (commercial)	3,797
U.S. Government ships	437
U.S. Government tugs	48
U.S. Government barges	44
Foreign small boats	35
Foreign ships	2
Foreign tugs	3
Log rafts	495
	84,525

<sup>\*</sup>All figures represent one-way trips.

Source: U.S. Army Corps of Engineers, Seattle.

Floating Bridge (at its west end) and the drawspan at the east end of the Lake Washington Floating Bridge, with the restriction that no motorcraft can come within 50 yards of the shoreline except to berth.

On the Lake Washington Ship Canal are the Hiram S. Chittenden Locks, which maintains the water level between the sound and the lake. All vessels passing from the lake to Puget Sound must pass through these locks. Also on the Canal are four bridges which have drawspans to allow ships to pass under them. These bridges are, from west to east, the Ballard Bridge, the Fremont Bridge, the University Bridge, and the Montlake Bridge. (Also across the Canal is a railroad drawbridge west of the Ballard Bridge. It is open except when in use by a train.)

In Table 20 the clearance for each of

these four bridges is shown, as well as the number of openings for each in 1972, 1973 and 1974. Bridge openings have a significant influence on the vehicular traffic flow on the bridge arterials, delaying traffic from three to ten minutes at each opening. Figure 28 expresses the total openings of each of the four bridges by month for 1973 and 1974. Figure 29 shows the distribution of openings by time of day for May 1973, which is historically the most intense month of use. Figure 30 illustrates the number of bridge openings by day of the month for May 1973. This data indicates that the bridges are opened most often in the summer (when pleasure craft traffic is at its highest), on weekends, and during off-peak traffic hours, especially noon to 4 p.m. in the afternoon.

Within the confines of Lake Washington, there are few commercial shipping yards. Kenmore, Kirkland and Renton all have small facilities which handle commercial vessels. Table 21 identifies the categories and volumes of ship canal users for 1974. About 28% of the vessels using the canal are commercial. There is considerable commercial vessel activity on Lake Union where the NOAA fleet is presently berthed, and there is a large pleasure craft marina in Portage Bay.

At the present time, there are no changes contemplated for the waterway system itself. The City of Seattle has developed extensive plans for the redevelopment of the Lake Union shore, but no effect is foreseen on the ship movement patterns on the lake. No significant improvements are imminent to water facilities on Lake Washington itself.

#### e. Other Transportation Systems

Lake Union is used by pontoon aircraft, both privately owned and by an air charter service. These aircraft share the water surface with the vessels on the lake. The runway at Sand Point could be used for air transportation purposes, but the NOAA and city park use would preclude this.

There are no other significant transportation systems in the north end of Seattle. While the airspace above north Seattle is in the approach path of both Sea-Tac International Airport and Boeing Field, aircraft on these approaches are too high to be of any significance.

#### Conclusions

The existing transportation system is extensive and reasonably modern, and in general, the system was built for and can handle increased use. Sand Point Way N.E. is greatly underutilized because of both the decline of Navy activity and the diversion of traffic through newly built limited access routes. METRO transit, too, is utilized well below potential in the Sand Point area. With the prospect of a new limited access facility, SR522, being completed in the early 1980's, longer term capacity seems to be available.

Vessel routes and facilities are sharply contrasting. There has been little recent change in the Lake Washington Ship Canal except for routine maintenance. Waterway users must conform to the existing conditions requiring slow travel speeds, and in the interface with wheel vehicles at the bridges, waterway users are tolerated at best.

Yet overall, the transportation system is notable for its excess capacity when compared with that of other urban areas of similar populations.

#### 8. Historical and Archeological Factors

#### a. Historical Significance of the NOAA Site

In response to formal inquiries by NOAA to the Washington State Historical Society<sup>8</sup> and the Advisory Council on Historic Preservation<sup>9</sup> spokesmen for these bodies stated that there are no features within the NOAA site of historical merit. Aviation buffs note several historical aviation events at the airport, involving early aviation achievements.

### b. Archeological Significance of the NOAA Site

Shoreline locales were favored by native American tribes as living areas; thus there is reason to expect some archeological materials remaining on undisturbed shores of Lake Washington. Formal inquiries elicited responses from University of Washington Department of Anthropology<sup>10</sup> and the Regional Archeologist for the National Park Service<sup>11</sup> stating there is no record of significant archeological materials occurring on the NOAA site. Potential archeological significance of the project area is reduced in proportion to the amount of landfill and excavation that has already occurred. Navy records and historical map comparisons indicate that the shorelines and inland surfaces were dramatically altered by successive phases of excavation, filling and paving in order to create the existing airport facilities. Consequently, there is little reason to expect that archeological resources that might have been present on the site are now intact and retrievable.

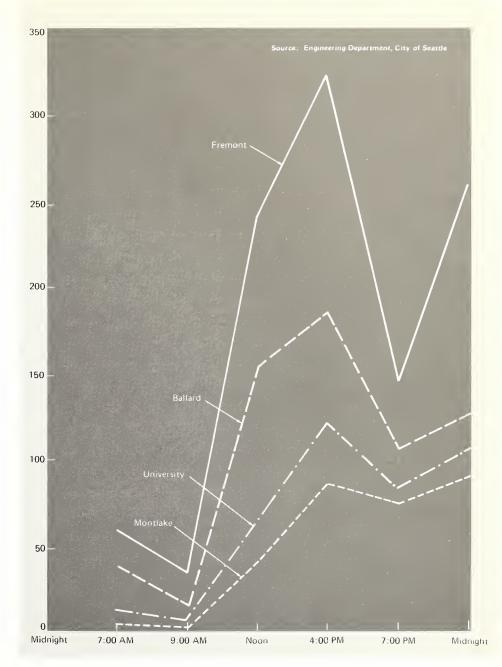


FIGURE 29. Number of Bridge Openings by Time of Day, May 1973

<sup>&</sup>lt;sup>8</sup>Letter from F. L. Green, Librarian, the Washington State Historical Society, Tacoma, Washington, March 29, 1974.

<sup>&</sup>lt;sup>9</sup>Letter from D. M. Hansen, Chief of Office of Archeological and Historic Preservation, Advisory Council on Historic Preservation, Olympia, Washington, April 11, 1974.

<sup>&</sup>lt;sup>10</sup>Letter from R. C. Dunnel, Chairman, University of Washington Department of Anthropology, Seattle, Washington, April 3, 1974.

<sup>&</sup>lt;sup>11</sup>Letter from C. F. Bohannon, Regional Archeologist, National Park Service, Department of Interior, Seattle, Washington, April 5, 1974.

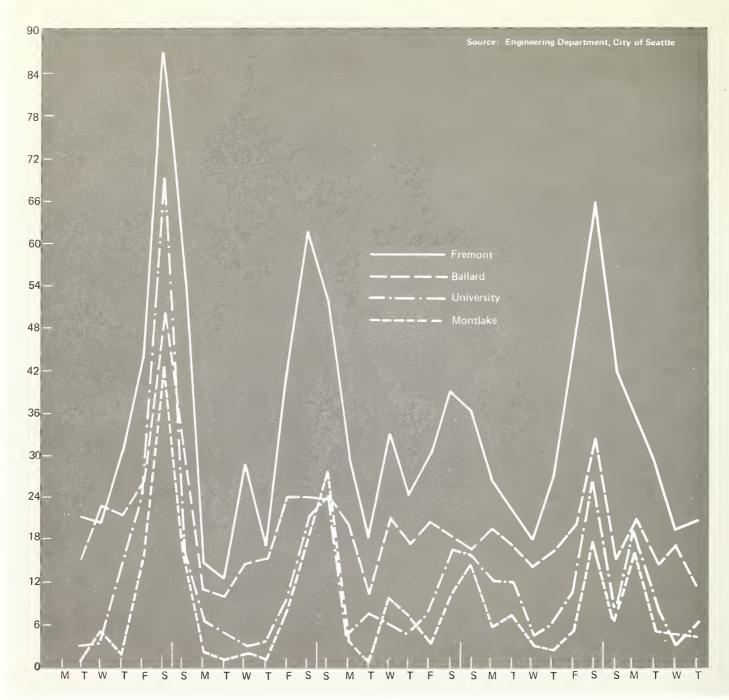


FIGURE 30. Bridge Openings by Day of Month, May 1973

#### **PART IV**

# Environmental Changes and Mitigating Measures for Potentially Adverse Impacts

#### A. ENVIRONMENTAL CHANGES RESULTING FROM THE PRO-POSED ACTION

#### 1. Changes in Natural Conditions

#### a. Air Quality

Emissions from NOAA Vessels. The effect of NOAA's vessel operations through the Lake Washington Ship Canal and at Sand Point was estimated for the years 1976 and 1980. The method employed was to consider both the emissions from, and the impact on, a belt along the Lake Washington Ship Canal, extending to Sand Point as the principal zone of influence of the change in emissions due to the change in operations. Because the vessels are all oil fueled, the air contaminants emitted by them include all the principal air pollutants such as suspended particulates, sulfur oxides, nitrogen oxides, hydrocarbons, and carbon monoxide. Considering the relative amounts of pollutants emitted by the engines, as well as the locality in which the pollutants are being emitted, it was concluded that suspended particulate emissions would be the only standard in danger of being exceeded as a result of the NOAA project. The effects of the vessels' operations were considered in terms of the suspended particulate ambient air quality standard (both annual and 24hour averaging times), although an emission inventory was made for the particular zone for all five of the pollutants mentioned

A special study was made by the Puget Sound Air Pollution Control Agency of the short-term concentrations which would result from a "worst case" condition in which all of NOAA's twelve vessels left at one time. Under these conditions, the vessels would leave the base at Sand Point traveling a speed of 5½ knots through the Canal and stationed at one-mile intervals. (Normal speed for NOAA vessels in fresh water is four knots.) Under these conditions the total particulate released during the warmup period at Sand Point would be 6 pounds, and 12.5 pounds each along the route from Sand Point to Lake Union and from Lake Union to Shilshole Bay, for a total of 31 pounds of particulates. As a reference point, this would be less than one-fifth the daily release of particulates from the stack of the University

of Washington steam heating plant during 1972.

An alternate approach would be to consider the concentrations that would result along the route of travel from the operations of these ships on the same worst case basis. A typical NOAA vessel, the RAINIER, when moving at 5½ knots through the Lake Washington Canal, consumes 40 gallons per hour of oil fuel with an average particulate emission of about 1/8 gram per second. Under highly stable conditions the particulate concentration due to the vessel would decrease to about three micrograms per cubic meter at a point one kilometer behind the vessel, a traveling distance requiring about 5.9 minutes. This calculation uses the standard Gaussian formulas12 and assumes that there is no wind and that the concentration is at receptor level in the vessel's wake. The presence of a wind would further reduce this concentration. By way of comparison, this instantaneous  $3\mu g/m^3$  concentration ranks with the lowest 24-hour suspended particulate concentrations ever recorded in the region. This is not meant to minimize the effects of movement of ships; actual ambient suspended particulate concentrations are, of course, caused by a variety of sources and would be much higher. The comparison demonstrates the order of magnitude of the effects of these sources.

Effect on Air Quality from NOAA Vessel Operations. To estimate the effects of the proposed change on the general area, it was recognized that the area most affected would be in the vicinity of the Lake Washington Ship Canal and that part of the west shore of Lake Washington reaching from Sand Point down to the Portage Cut. A "zone of influence" extending two kilometers on either side of the Lake Washington Ship Canal and then extending inland a distance of two kilometers along the aforementioned section of Lake Washington was studied. All Air contaminant emissions originating in this zone were tabulated (using the latest emission inventory information available at this time, the 1972 tabulation). This zone was in turn assumed to be the principal recipient of air contaminant emissions from the ships through use of proportional roll forward modeling technique (U.S. Environmental Protection Agency, 1974).

This modeling technique is limited in that it does not consider topography and the daily dynamic variations which influence air pollutant concentrations. However, in the absence of stability wind rose data and extensive air monitoring data, as in this instance, it is the preferred technique. It has been widely used in air quality planning studies made under the auspices of the U.S. Environmental Protection Agency. The choice of a zone of influence of a width of four kilometers was a judgment factor on the part of the air quality analysts. The air pollution effects would be experienced throughout this zone and, to a lesser extent, adjacent areas. However, if too large a zone is selected, then the relative effects of the change proposed will be underestimated since concentrations are projected by the use of proportion calculations.

Total emissions were tabulated for 1972 for the zone of influence (including mobile sources on all arterials for which City of Seattle Traffic Engineering tabulations were available). Ship and boat traffic and the resulting air pollutant emissions were calculated, utilizing the records of the Corps of Engineers at the Hiram M. Chittenden Locks and the block records and other tabulations maintained by the drawbridge tenders at the Ballard and University Bridges. The air contaminant emissions for the year of study as well as monitoring records for that year were projected to 1980, when NOAA vessels would be fully utilizing the Sand Point base. Annual geometric means and suspended particulate concentrations were calculated; these were extrapolated into 24-hour maximum suspended particulate concentrations that would be expected through the use of the Larsen Lognormal Model. 13

The Larsen technique indicates that there

<sup>12</sup>Turner, D. Bruec, Workbook of Atmospheric Dispersion Estimates, Cineinnati, Ohio: U.S. Department of Health, Education and Welfare, Public Health Service, National Center for Air Pollution Control, 1967 (1970 Revision).

<sup>&</sup>lt;sup>13</sup>Larsen, Ralph I., A Mathematical Model for Relating Air Quality Measurements to Air Quality Standards, Research Triangle Park, North Carolina; Environmental Protection Agency, Office of Air Programs, November 1971.

will be no violations of either standard in 1980. Results are tabulated in Table 22, showing that NOAA vessel emissions will not be distinguishable from anticipated background conditions.

Effects of Vehicular Traffic Generated by the NOAA Center. In vehicular traffic air quality impact studies for the DEIS, the California highway Model<sup>14</sup> was used to estimate carbon monoxide (CO) concentrations. Estimates were made according to the criteria established by the U.S. Environmental Protection Agency (EPA) for highway complex sources under the EPA indirect source regulation. The results indicated no probable CO ambient air quality standard violations. Considerable recent experience with this approach indicates that the technique tends to overestimate CO concentrations that would be experienced by humans over a continuous 8-hour period.

In preparation for this document, the EPA highway modeling technique was used together with the revised traffic studies (see Part III), representing NOAA, NSA and City Park traffic. Traffic volumes were estimated for the year 1982 (the probable first full year of NOAA Center operation), and CO concentrations were estimated along 12 road segments and in four parking areas (see Figure 31). As represented in Figure 31, the 1982 concentrations were predicted at nine receptor points. Effects of wind action and direction changes in the segments were also considered and are represented in the summary table. Probable vehicular CO emissions for 1982 were calculated according to EPA procedures, and by standards for the 1977 through 1982 model year automobiles, over 1976 levels. Should more restrictive emission standards for 1981 and 1982 be established, estimated CO concentration would decrease accordingly.

Estimated CO concentrations that would represent a "worst case" circumstance have been achieved by utilizing 1982 peak period traffic estimates for 8-hour concentration estimates. In addition, these estimates were made more conservative by assuming low, stable wind conditions. In this analysis wind was assumed to continue over a single direction at an average speed of 2.2 m.p.h. (one meter per second) for a full 8-hour period. Surface winds in the Sand Point area exceed 2.2 m.p.h. on the order of 90% of the time.

As represented in the tabulation in Figure 31, the highest 1982 concentration of CO would occur in the Sand Point way corridor south of N.E. 65th, if there were low, stable winds from the northeast. Yet 7.5 milligrams

TABLE 22. 1980 Projected Suspended Particulate Concentrations, Lake Washington Ship Canal

	ANNUAL	EXPECTED MAXIMUM
	GEOMETRIC MEAN	24-HOUR CONCENTRATIONS
1980 (with NOAA)	44	141
1980 (without NOAA)	44	141 .

Source: Puget Sound Air Pollution Control Agency

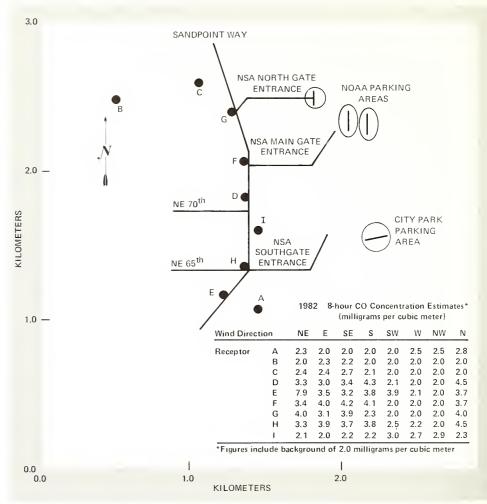


FIGURE 31. Vehicle Corridor Segments, CO Receptor Points and Estimated CO Concentrations, 1982

per cubic meter is considerably below the 10 milligram per cubic meter standard. As indicated in the tabular summary, most 1982 8-hour CO concentrations would range from 2-4 milligrams per cubic meter, which, when discounted for the 2 milligrams per cubic meter background estimate, would be relatively insignificant in terms of air quality danger.

Long-Term Changes in Air Quality. Emissions from NOAA vessels and from vehicles traveling to the NOAA Center would not violate any existing air quality standards. As represented in Figure 31, carbon monoxide concentrations estimated for 1982 would be well below the 10 milligram per cubic meter

8-hour standard. The one-hour standard, 40 milligrams per cubic meter average, is considered to be less strict than the 8-hour standard; therefore, violation of this standard is improbable as a consequence of traffic generated by the NOAA Center development.

#### b. Climate

No short- or long-term modifications to the climate attributable to the proposed project have been identified.

#### c. Water Quality of Lake Washington

Long-Term Changes in Water Quality. The new NOAA Center would be required to

<sup>&</sup>lt;sup>14</sup>Beaton, J. L., Skog, J. B., Shirley, E. C., and Ranzieri, A. J., Mathematical Approach to Estimating Highway Impact on Air Quality, Sacramento: State of California Business and Transportation Agency, Department of Public Works, Division of Highways, July 1972.

have comprehensive effluent containment and disposal facilities, including appropriate surface water controls. Because of these there is no expected change to the water quality of Lake Washington attributable to the operation of the NOAA Center. In comments on the DEIS, METRO officials noted that the NOAA project is not likely to cause long term adverse impacts to Lake Washington water quality.

Short-Term Changes in Water Quality. Dredging for the piers, construction of the pier complex, excavation for the 2-acre lagoon and basic site preparation for the new facility will cause temporary, localized lake water turbidity adjacent to the construction activity. Several surface acres of the lake could be affected. Most of the turbidity declines sharply as the silt settles after the construction disturbance. In settling studies conducted by Patten (1975), representative samples of sediment were tested in laboratory conditions. Patten found that the bulk of suspended solids in the water could be expected to settle in less than 40 hours, after being put in suspension. A small portion of fine silt would linger in suspension for some weeks, having the effect of reducing temporarily the water transparancy around the dredge site.

#### d. Soil

Long-Term Changes on Land. Most of the present pavement will either be removed or covered with soil as a part of site preparation and alterations. This material plus the dredged material will be used on the site for construction of hills, berms and related landscaping forms. Approximately 800,000 cubic yards of excess material will be available for this purpose. Use of the 114-acre site is planned as follows:

- Approximately 85 acres of landscaping and outdoor work space, and 9 acres of land covered by buildings;
- Approximately 18 acres devoted to roads, walks, parking, fire lanes and pier staging area:
- Approximately 2 acres devoted to lagoon and slough;
- Removal of approximately 100,000 cubic yards of soil to create a lagoon (Adds approximately 1,100 feet of shoreline);
- Removal of existing structures, except Buildings 1, 32 and 33. Buildings 1 and 32 are expected to be modified. Building 33 will be used for storage during construction. Long term use of this building will be set before the end of construction.

NOAA is required to provide a 7 foot chain link fence with barbed wire on top along the NSA boundary. Gates would permit access to and from the NSA. A curvilinear, below-grade fenced barrier, concealed in plant materials is planned between the park and NOAA sites (See Figure 12). Gates would permit access between the park and NOAA sites.

NOAA vessel movements in the Lake Washington Ship Canal and on Lake Washington would not cause wakes hazardous to existing shoreline quality. See Figure 11.

Long-Term Changes in Adjacent Lake Bottom. Dredging for the pier area will affect approximately 470,000 square feet of the lake bottom and involve the removal of 260,000 cubic yards of existing bottom soil, using water-based and shore-based dredging equipment. Filling with about 60,000 cubic yards of material behind the riprap revetment will be required in order to support a pier height staging area. Excess dredged material will be deposited on land, behind appropriate water containment berms.

About 1,300 feet of present shoreline back of the dredged area will be retained by a riprap revetment, installed subsequent to dredging.

Short-Term Changes on Land. During construction, short-term storage of soil, rubble and wet dredged material may require containment berms and mounds of material on the site. The site sediment analysis (Exhibit G) and the history of the site indicate a probable low level of organic matter in the lake bottom sediments. Therefore, on-land disposal of the dredged sediment is not likely to cause significant odors. Security fencing and a few temporary construction buildings will be used as required during construction phases.

Short-Term Changes in the Adjacent Lake Bottom. During dredging there will be considerable alteration of the contour of the lake bottom in the dredge area. Relatively slight alterations of the shoreline configuration will occur during pier construction and revetment installation.

#### e. Vegetation and Wildlife

Long-Term Changes in Vegetation and Wildlife. A net of about 85 acres of vegetation will be achieved in connection with landscaping. In this process about 40 acres of existing pavement would be transformed to vegetated area. Local varieties of trees, shrubs and grasses would be used over the site. Waterfowl are not likely to be affected by the new Center in operation. Some land birds and ground animals are likely to be displaced or eliminated. On-land breeding and feeding areas will be substantially altered, even though the area would be increased in size over the present. Over the long term, land birds and ground animals could be expected to resettle in the area.

Short-Term Changes in Vegetation and Wildlife. Approximately 80 to 90 percent of the present vegetation of the site may be covered over or otherwise disturbed during construction. Grassy portions of the site along the shoreline would be left intact as much as possible. Water-fowl will be temporarily displaced in the lake and shoreline areas involved in construction activities. Similarly, they will be displaced from land

feeding and resting areas. Ground animals and birds will be almost totally displaced during the construction period.

#### f. Aquatic Biota

The impact of dredging and pier construction on the biota involves the seasonal abundance of life from the shoreline wash zone to the 30 foot contour along the proposed pier area. Possible alteration of the biota would be least at the time of year when the biota is least susceptible and the biomass is lowest. The benthic fauna would be the most affected group. Benthic fauna destruction in the dredge area would be complete and unavoidable. Proper timing and dredge precautions having the effect of containing and reducing suspended solids can minimize damage to benthic fauna in adjacent areas. Patten (1975) and Shepard (1975) found that the period from November to March has a sustained low level of animal and plant life in the proposed dredge area, Pontiac Bay. The least overall biological effects would occur from January to March. Dredging at this time would affect 1/3 to 1/10 the biomass that is present in the spring and summer months.

Patten (1975) noted that while certain types of life would be destroyed, others will tolerate the siltation effect of dredging. Mobile species would probably avoid the area. Plants and some benthic animals that are sedentary or are of low mobility within the dredge site would be destroyed by removal or burying; major biota included are burrowing insect larvae, (diptera) chironomidae, worms (oligochaetes) clams, snails and some vascular plants.

Heavy loads of suspended solids would probably have no direct effect on some of the animal life. Patten tested several species for tolerance to a stock mixture of highly turbid lake water. Crayfish survived the test and for several days following. All cadis larvae held in a stock mixture of silt for 96 hours survived. Copepods and Daphnia (specie No. 1) both survived lake water better than silted water.

Both dredging activity and suspended silt settling would discourage use of the area by animal life. Crayfish showed no preference between silted and normal lake water. Crayfish were tested for their preference between glacial till and the fine sterile lake bottom substrate; preferences were not noted. This indicates the glacial till type bottom resulting from dredging may not be avoided because life is not repulsed from it. Since the bottom would be disrupted by removal of the food-bearing substrate and be replaced by sterile-tending silt, biological attraction related to feeding would be eliminated.

It is expected that by using any dredging procedure, near complete bottom rehabilitation will occur in a year or two. Such rehabilitation could be possibly accelerated and enhanced if a water column fence (sheet

plastic suspended from a log boom around the dredge activity) were employed which would both contain sediment dispersal and ensure that silt fallout would occur in the dredge area, helping to re-establish a biologically attractive bottom. Dredge depth is great enough to protect the bottom from distrubance from vessel activity after construction.

The riprap revetment will support the growth of mosses and algae, as will the pier piles. Considerably higher levels of this type of growth would result after construction is completed.

Paint chips and powder and small debris from vessel-related activities will not have significant adverse effects on the regenerating bethnic community because of the probable small amounts falling away from vessel maintenance activities. Installation of concrete pilings would be accomplished after the area is disturbed during dredging. The shoreline area away from the pier development will remain unchanged except for 50 to 100 feet involved in the construction of the lagoon in the eastern portion of the site. Patten observed that pilings will have some effect in reducing water movement under the piers. Suspended particles (detritus) would settle at more than normal rates, having the positive effect of enhancing the regeneration of the benthos.

Changes in Fish Population and Migration Patterns. Patten's tests of fish reaction to suspended solids showed that Coho salmon and prickly sculpin had complete survival during and for five days after testing in highly turbid lake water. Tests showed that Coho and prickly sculpin avoided heavily silted water, indicating that dredging activity and turbid water would discourage fish use of the area. Sculpins and mysid are the only numerous mobile fish in the area in the winter, and are apparently bottom feeders. Therefore sculpin could be expected to avoid winter dredging both by reason of avoidance of suspended solids and lack of food. Mysid would probably avoid the area because of the lack of food.

Shepard's data and research showed that the shallow area of Pontiac Bay (0-30 feet) is used for spawning and rearing young fish as well as habitat for several adult species. Several migratory species were found in the area, before moving to creeks and streams for spawning. Dredging to a thirty-foot depth would effectively remove the present natural food-related attractiveness of the area to fish. Recovery will vary with the reestablishment of benthic food sources. Patten noted that a permanent reduction of the biomass may occur because of the loss of the highly productive shallows. For example, the present reduction in numbers of invertebrates from 10 to 30 feet is 10:1 for chironomids, 4:1 for oligochaetes and 2:1 for clams.

Shepard's data showed that the Coho salmon use much of the water column in the mid depth stratum (11-30 ft.) as well as deeper areas during spawning migration. Data on juvenile sockeye, Chinook and cutthroat trout tended to show similar migratory patterns. Only the rainbow trout of the salmonids were found to be characteristic users of the inshore stratum (0-10 ft.). In the DEIS a two-slope revetment beneath the piers was proposed as an approach to preserving an unencumbered salmonid migratory path in the 0-10 ft. stratum. The innovation does not appear to serve a useful purpose since most salmonids appear to migrate in the 11-30 foot stratum. Shepard was unable to establish specific significant adverse effects of the piers on migrating salmonids.

The one area of possible sockeye beach spawning identified by Shepard near the east end of the dredge site would be removed. Use of widely spaced reinforced concrete piles helps avoid the dense pile arrays which disrupt water movement and fish migration and feeding. The planned revetment configuration—in contrast to a vertical bulk-head—would probably not provide a particularly attractive refuge for prey species affecting migratory fish.

The sharply increased growth of mosses and algae likely to occur on the piles, the revetment, the hulls of inactive vessels and the water shading from the piers may result in a noticeable increase in the population of spiny ray and soft rayed forage species fish, such as perch, the sunfishes, largemouth bass, and black crappie. This effect would increase with the presence of shallow areas available for young fish. Since NOAA vessel movement activity is highest during winter months when the fish activity is lowest, it is probable that vessel activity will not significantly handicap whatever reestablishment and growth of fish populations that may occur in Pontiac Bay.

There is a low risk of oil spills in the pier area (see Part III. "Vessel Operations and Pier Area Activities") because fueling activities are accomplished elsewhere. Containment booms such as presently used at Lake Union will be used at the Sand Point site to prevent significant aquatic biota damage in the event of a spill episode.

Changes in Plankton Circumstances. High levels of water turbidity will have the effect of restraining phytoplankton production until the water clears to normal levels. About 80,000 square feet of lake surface would be shaded by the pier complex. Shading of phytoplankton will also reduce their productivity. But in relation to the overall lake productivity, this is an infinitisimal proportion.

Long-term Changes in Aquatic Biota. Ultimate changes as a result of the dredging, pier construction and pier area use by

NOAA vessels can be predicted to some extent; a post construction study would be necessary to provide information that is both comprehensive and certain. NOAA expects to arrange for a post-construction study to provide this information. The significant change in the Pontiac Bay area as a result of the pier development is the removal of the shallow area, removing at the same time the food and rearing and spawning resource. The dredging activity and water turbidity would not be a significant long term adverse impact. Patten states that it is likely that a substantial resettlement of the benthic community will occur, yet the absence of a shallow area may not allow emergence of a biomass equal to existing conditions. Significantly however, the overall biological productivity of Lake Washington cannot be expected to be altered by the pier area operation. Or in other words, the adverse biological effects of the pier development are probably not of measurable significance in terms of the lake itself. A beneficial effect of modest benefit could be expected to occur in that spiny ray fishes would increase over present levels in the pier area.

Short-term Changes in Aquatic Biota. During dredging, revetment construction, and pier construction the turbidity will probably blight the pier area, biologically, for a month or more. These effects can be confined and minimized by dredging during the winter months. Sediment studies indicate that trace metals, pesticide residues and similar sediment which would be biologically dangerous matter are not expected to be dispersed in the water column during dredging. Such materials occur at relatively low levels. (See Exhibit G.)

#### g. Vessel Noise Assessments

Vessel noise was measured for the vessel RAINIER and incorporated with previously measured data from the vessel OCEANO-GRAPHER. Table 23 represents the projected noise levels for the two largest classes of vessels operating under standard conditions during docking and departure, and presents the loudest noise sources associated with NOAA vessel or small boat operations.

TABLE 23. NOAA Vessel Noise Measurements

Range (Yards)	Class I Vessel OCEANOGRAPHER (dBA)	Class II Vessel RAINER (dBA)	
250	65.0	54.0	
500	60.5	49.5	
1,000	54.5	43.5	
2,000	48.5	37.5	
4,000	42.5	31.5	

Source: Harris F. Freedman and Associates, Noise Survey for NOAA, July 1972; and Vibracoustics, Noise Survey for NOAA, April 1974.

Based on these assessments, the distance at which the noise from the OCEANO-GRAPHERR and RAINIER will reach 55 dBA is 940 and 215 yards, respectively. The nearest residences to the NOAA site will experience noise levels of 59 dBA and 48 dBA from the two vessels at the closest estimated point of approach (600 yards). Even in the most extreme circumstance, frequency of such episodes would not be more than six times a year for the OCEANO-GRAPHER, each for a period of less than two hours. Although sounds created by watercraft are exempt from state noise limitation, use standards and/or performance standards are expected to be established no later than June 30, 1977. Noise from the OCEANOGRAPHER would be indistinguishable for noise measurement purposes from the ambient noise range (without traffic) of the north shore of Sand Point (56-60 dBA). Noise from other vessels would be below the range of ambient noise, with traffic, for residences to the north and to the west of the NOAA site.

Vessel whistles are a source of intermittent noise. A typical Sand Point to Lake Union transit would require a 10 second whistle when leaving the pier and a 10 - and 3 second whistle to signal the Montlake and University Bridges. Estimates of whistle noise levels for one of the larger NOAA vessels at the nearest residential lot line would be 96 and 90 dBA for shore residences in Montlake and in the Sand Point area. This does not exceed State maximum noise levels as vessel whistles do not operate continuously for more than five minutes. Whistles are used only when necessary to signal bascule bridges, for fog warning and to signal other vessels while making Ship Canal transits.

Active vessels of the NOAA fleet are typically at sea during March through October; therefore, dockside activity of any significance would occur from about November through February. Major repairs on NOAA vessels (the noisiest activities) are accomplished in commercial shipyards in Elliott Bay or Lake Union. Maximum noise levels generated by pierside operations result from unloading and loading ship supplies, minor repairs, and engine warm-up prior to vessel movement.

NOAA equipment which will contribute to dockside noise levels, are paint remover grinders, pneumatic impact devices, auxiliary air compressors and boilers, a rubber-tired mobile crane and electric powered forklifts. Surveys of NOAA dockside activities indicate that maximum noise levels at the nearest residential boundary due to dockside equipment noise would be 52 dBA. This level is within State noise standards. Dockside equipment noise would also be within noise levels permitted near recreational facilities such as the proposed city park (57

dBA). New equipment acquired for use at the Sand Point site will be pretested to assure compliance with noise standards.

Construction Noise. Higher local noise levels are to be expected during construction of the new Center. The most significant probable source of noise would be pilc driving. Estimated maximum noise levels at the nearest residential boundary (600 yards) is 64 dBA. As presently planned, installation of piles for piers would last for approximately 6 weeks. It is possible that on-land construction may require piling for foundation supports, so intermittent pile-driving activity is a possibility. Construction activity is expected to take place over a 5-year period beginning in late 1976 or early 1977. Although construction activity is exempt from State noise controls, none is expected to exceed 75 to 80 dBA. NOAA will specify that all contractors utilize state of the art noise abatement methods in construction activities.

Traffic Noise. The impact of increased traffic noise due to the NOAA facility is based on traffic statistics for the Naval Support Activity obtained from the State Highway Department. Ambient daytime sound levels measured on Sand Point Way NE were used in evaluating the impact on the community. Initial NOAA-created traffic is of the same order of magnitude as the general annual increase in traffic predicted by the State Highway Department. However, the possible expansion of NOAA activities over a 10-year period to a peak of about 1200 vehicles will increase the predicted peak traffic noise level of about .5 dBA, assuming one-fourth of the 1200 vehicles will travel north of Sand Point. The NOAA traffic would mainly affect the morning and evening peaks and would not influence the non-peak levels. During the period March through October in a typical year, vehicles of ship-based personnel would be absent from the traffic system, reducing traffic related noise for the period.

Estimates are that initial peak traffic noise levels will not be detectable along Sand Point Way NE at Matthews Beach. Increased traffic noise southward and westward from Sand Point is estimated to be of the same relative magnitude; i.e., initial peak noise levels are negligible and after the ten year expansion, about a .5 dBA increase in peak levels.

Long-Term Changes in Sonic Conditions. NOAA activities on the site will have no significant long-term adverse impact in the Sand Point area. An indirect adverse impact is the contribution of noise from NOAA activities to present ambient ranges which tend to maintain these levels, rather than helping to reduce them.

Short-Term Changes in Sonic Conditions. Construction activities will be above ambient noise levels in the Sand Point area.

#### 2. Changes in Public Utility Resources

(Liquid waste disposal, solid waste disposal, energy supply and potable water.)

a. Long-Term Changes in Public Utility Resources

Local utility strategies and service systems have sufficient capacity to serve the facility when it becomes operational. NOAA's energy and water demand and waste disposal service needs will increase over present levels in the long term because of the opportunity to expand provided by the new Center. Indirectly, the new Center will preempt apparently unused capacity, forcing, along with all other users, utility capacity increases at some future date.

### b. Short-Term Changes in Public Utility Resources

Construction activities may generate some solid waste loads above that amount that can be utilized on the site. The material that requires an alternative disposal can be disposed of in presently available commercial landfill sites. There are no significant short-term changes expected during construction in the sewage, water and energy systems.

#### 3. Changes in Social Conditions

Changes in the Sand Point area as a result of the NOAA Center can be assessed in terms of population growth and consequent alterations in local service capabilities; changes in attitudes of residents; and changes in human resources such as educational, recreational, and cultural resources.

### a. Changes in Residential Density and Population

At this time NOAA employees reside in all sections of the city and in suburbs, with the fewest in the southeast and southwest quadrants. This indicates that there are not likely to be significant migrations to the Sand Point area, since North and East residents enjoy convenient access to the area. New employees to NOAA will find a favorable housing vacancy rate in the Sand Point area and the attractiveness of the area to be an inducement to residential selection there. However, in comparison with suburban houses, Sand Point area homes may be more expensive. Yet, favorable commuter access corridors of the city increase residence selection choices with little loss in commuting convenience. These circumstances suggest little likelihood of noticeable changes in residential density and population in the Sand Point area, beyond normal growth. Similarly, public facilities and services will not be pressed beyond normal growth pressures, as a consequence of the NOAA Center development.

b. Changes in Attitudes of Present Residents Provided that residents perceive the new Center as being visually interesting or pleasing, the new Center is likely to be a source of considerable community pride, just as the Battelle Northwest facility to the south is viewed. And the residential character of the surrounding neighborhoods would be enhanced by the removal or covering of the present airport paving which would increase the attractiveness of Lake Washington views. For those who dislike the NOAA Center or prefer an alternative use of the site, the new Center would have an adverse effect. Comments on the DEIS tended to corroborate this assessment.

#### c. Changes in Human Resources

The NOAA Center would significantly extend the educational and recreational resources of the community. Scientific service and research activities in the NOAA Center would be unique in the area, which, together with the proposed new park, are an incomparable new resource, both at the community and regional levels. Some change may occur in school populations, if NOAA should undergo an unexpected surge of new employment.

#### d. Long-Term Changes in Social Conditions

For most people in the Sand Point area who can see Sand Point or would go there for some educational or recreational purpose, the NOAA Center would be a strongly beneficial change over the present circumstances. In addition, so far as natural conditions of pre-airport times can be reestablished, there would be strong environmental as well as visual merit for the community.

e. Short-Term Changes in Social Conditions No significant short-term changes are likely.

#### 4. Changes in Economic Conditions

### a. Long-Term Changes in Economic Conditions

The value of the new Center to NOAA will be of moderate long-term economic benefit. For example, the new Center allows the following:

- Regional consolidation of NOAA activities with substantial efficiency gains in administering and supporting these activities
- Significant reduction in costs of future expansion
- Inducement for greater interrelationships and shared technologies among local NOAA components
- The capability and critical atmosphere for achieving a "threshold" size for NOAA functions, allowing for greater organizational strength and scientific output
- Proximity to the University of Washington and to the Battelle Northwest Institute encourages more productive cooperative research and scientific service endeavors
- The opportunity and stimulating context for developing a new NOAA technical

training program, utilizing both NOAA resources and those of Battelle Northwest and the University of Washington.

In the larger community, consolidation and likely future expansion is projected to increase direct, present employment by over 500 in the next 25 years. Utilizing employment multipliers derived from the Duwamish River Basin Study, 15 this increase could result in an additional 310 jobs generated statewide, including 125 within King County. Utilizing an income multiplier approach and the current average NOAA salary of \$15,100, an additional long-term increase of 500 employees could result in as much as \$19,000,000 in additional personal income in Washington State.

A new NOAA facility is not likely to have any significant impact on Seattle area retail and commercial location and relocation. Present NOAA employees live throughout the city, and employment growth is expected to average only 50 per year over the next six years. Thus, little effect on shopping patterns or commercial service requirements is anticipated.

Residential choice patterns are not likely to change for NOAA employees. It is not anticipated that over 25 percent of NOAA employees would locate near Sand Point. This would occur at a slow rate of perhaps 20-30 per year to achieve about 25 percent of the 1,400 employees by 1990. This rate is not significant either in terms of vacancy creation or housing demand in the Sand Point area.

There are potential indirect benefits to private industry as a result of the new Center. Creation of technologic capability has led to growth of high technology firms in the private sector. While there is little quantitative background on this phenomenon, the effects have been observed particularly in aerospace firms in southern California and in electronics firms in the Bay Area. Seattle has been recognized as having a similar potential with regard to aerospace diversification. <sup>17</sup>

Property tax yields will not be materially affected since Sand Point is not currently on tax rolls, but purchases services and utilities from the city. Leasehold taxes are paid by existing NOAA lessors, and these would

continue with subsequent occupancy at those sites.

#### b. Short-Term Economic Changes

The NOAA Center is not expected to be fully ready for occupancy until 1981. In the interim, approximately \$65 million of new funds will be used to purchase materials and services in the Seattle area.

#### 5. Changes in Visual Conditions

Changes in the visual environment are usefully assessed in terms of changes in relationships among all the new and remaining elements of a scene when new elements appear. The nature of visual impacts may be further divided into two parts: quality and intensity. Whether a change is beneficial, adverse, or of no significance is a subjective determination, whether arrived at by a single "expert" or by some popular consensus. Intensity or quality of impact is easier to describe objectively. Figure 32 identifies in detail the visual impact zones for the NOAA Center

# a. Criteria for Evaluating Visual Impacts Contrast,

- If the image of an object extends above the visual horizon and stands "against the sky" it will have more impact than if it does not.
- If an object is in sharp contrast to its setting as to hue or color value (lightnessdarkness) it will have more impact than if otherwise. Example: White ships on a dark lake surface.
- Contrasts in shape: A horizontal shape introduced among many slender towers will have strong visual impact.
- Contrasts in surface pattern and texture likewise are factors in visual impact. Example: Smooth gray concrete walls juxtaposed with a beach of gray pebbles and rocks.
- Shadow characteristics on sunlight can intensify visual impact, and impact may, therefore, vary by season and time of day
- Contrasts in visual scale can be the cause of impacts. A monumentally scaled residence can have considerable impact, even though roughly the same size as its neighbors.

Occupied Visual Field. Another useful factor in the valuation of the visual impact of NOAA at Sand Point is the magnitude of the part of the total visual field occupied by the NOAA development as seen from a particular viewpoint or location. Thus, in a sense, proximity is a criterion. The nature of the visual relationships between NOAA and its environs requires much more emphasis on the horizontal rather than the vertical extent of the NOAA image as seen from most viewpoints. The horizontal extent of the visual field of human vision is about 180

<sup>&</sup>lt;sup>15</sup>Seattle-King County Economic Development Council, Development Concept for the Duwamish Basin, Vol. III, Technical Appendix A, February 1974.

<sup>&</sup>lt;sup>16</sup>Shimoshoni, D. C. Regional Development and Science—Based in Industry, Essays on Regional Economics, Kain, J. F., and Meyer, J. R., eds., Harvard.

<sup>&</sup>lt;sup>17</sup>Rainey, R. B., et al., Seattle's Adaption to Recession. Santa Monica, California, Rand Corporation, Report to National Science Foundation, September 1973, pp. 47-49.

degrees and the vertical extent is about 150 degrees. 18

Most views of the NOAA site and proposed Center development have a much

larger scope horizontally than vertically. Therefore, in establishing the three zones of visual impact it has been the horizontal (much more than the vertical) extent of the visual image that has been considered along with other criteria. At many locations within Zone 1 any selected view including all the NOAA site will occupy 40 degrees or more

of the total horizontal visual field of 180 degrees. The 40-degree horizontal scope has been selected as an approximate minimum for major impact.

View Orientation. On sloping terrain the major view orientation of a particular location is perpendicular to the topographic contours at that location. The areas in the

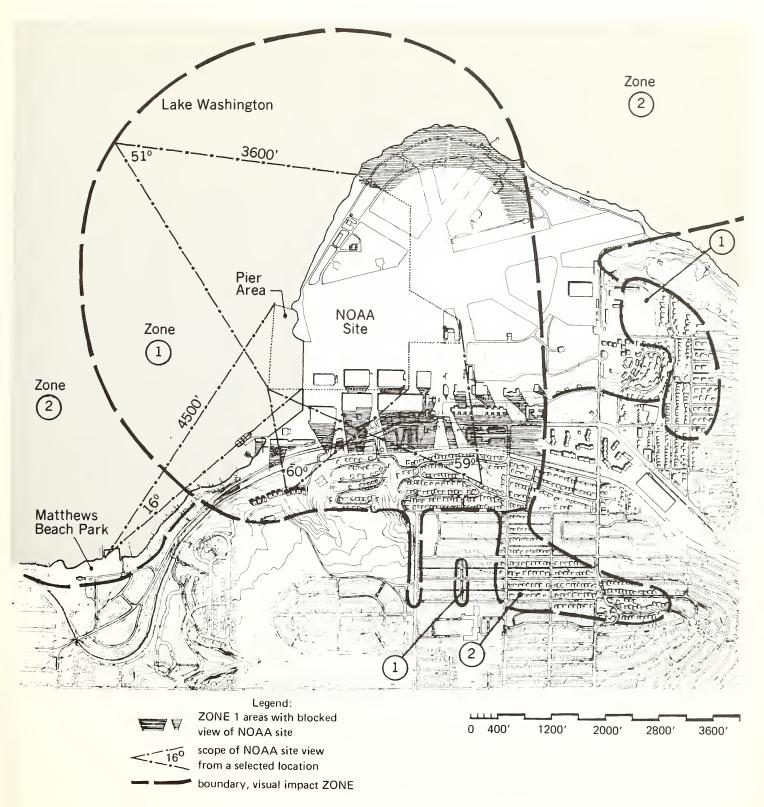


FIGURE 32. Detail of Visual Impact Zones

<sup>&</sup>lt;sup>18</sup>Gibson, J. J., Perceptions of the Visual World, p. 45.

environs of NOAA which are designated as major visual impact areas (Zone 1) are partly flat and partly sloping. The sloping areas of Zone 1 have views of the NOAA site which are close to perpendicular to their topographic contours. Their views of the site are direct, sometimes panoramic, and fairly close. In some circumstances view orientation occurs on flat terrain also. Nearby objects such as buildings which limit vision in some directions tend to direct visual attention towards more open views or vistas. This is a typical existing circumstance in the Naval Support Activity areas at Sand Point. The shaded or "hatched" areas on Figure 32 indicate areas where view of the NOAA site is blocked by buildings, terrain, or vegetation. The unshaded vee-shaped areas between some NSA buildings indicate corridors in which the NOAA development will be visible and will have major impact.

#### b. Visual Impact Zones

Visual impact in the three zones defined in Figure 32 is over-estimated rather than underestimated. Still, there are places within the three zones where it will be impossible to see the NOAA development, and other locations within the three zones where only fragmentary glimpses are possible. These circumstances vary with the weather and seasons.

Visual impact Zone 1 includes areas which receive major impact. Figure 32 shows in detail the area included and also illustrates the horizontal scope of visual field occupied by the NOAA site from some specific viewpoints. In addition to the main part of Zone 1 surrounding the NOAA site, a separate smaller kidney-shaped area on the north slope of the Windermere neighborhood is also designated Zone 1 because of its strong view orientation towards NOAA and its unobstructed view.

Visual impact Zone 2 includes two separate areas which receive major to moderate impact. (See Figure 20.) The larger section is a wide belt surrounding Zone 1 on its north, east, and most of its south sides. Most of this section of Zone 2 is Lake Washington surface but it extends slightly beyond the east shore of the lake to include the green hillside above O. O. Denny Park and Champagne Point. Further south it includes the Waverly Beach residential area, and the Kirkland waterfront and neighborhoods from Marina Park to Houghton Beach; the north ends of Yarrow and Hunts Points are also included. The other separate section of Zone 2 lies along the more sharply sloping terrain extending south from N.E. 70th Street almost to N.E. 60th Street. This area is known as View Ridge north of N.E. 65th Street and Hawthorne Hills south of N.E. 65th Street.

Distances from the NOAA site boundaries to the nearest locations in Zone 2 vary from a minimum of 1,200 feet (south) to a

maximum of about 3,400 feet (northeast).

Visual impact Zone 3 may be described to include any and all locations from which the NOAA development will be visible outside Zones 1 and 2. Zone 3 areas receive moderate to zero impact from the NOAA development. The minimum distance from a Zone 3 location to the NOAA site is 1.5 miles. At this or greater distances, the visual image of the NOAA vessels and land development will be relatively small—a 17-degree segment of the 180-degree horizontal visual field, and decreasing with increasing distance. Therefore, in Zone 3 it is anticipated that although NOAA could be a visual landmark, it would be a distant landmark and in no way major in impact.

#### c. Changes in Visual Elements on the Site

- Possible beautification of NSA Fourth Avenue, the present main entrance to NSA and proposed main access route to the NOAA site. (Any changes must be approved by NSA officials.)
- Alteration and beautification of the present NSA North Gate
- Removal of all existing buildings. Hangars
   1 and 32 are expected to be altered to
   meet space needs and to conform to
   Center design themes. The long-term fu ture use of Hangar 33 has not been
   determined
- Development of NOAA site according to the concept shown in Figure 6
- Periodic appearance of NOAA vessels at the piers on the north shore of the site. Most vessels will be away from base between March and November, except for brief visits for servicing or provisioning.
- Some vessels may be inactive and remain at the base for longer periods from time to time
- Movement of the NOAA vessels between the base and Lake Union as they leave the base or return will be a change in the visual scene of the Lake Washington Ship Canal east of Lake Union
- Weekday appearance of several hundred cars and trucks, depending on the number of vessels at the Center.

#### d. Long-Term Changes in Visual Conditions

Parts of View Ridge, Aviation Heights, and parts of the Windermere neighborhood have a high view orientation towards the NOAA Center. From the proposed park and the lake, view orientation is more horizontal. Because the NOAA development will be low in scale and relatively spread out, the visual presence of the NOAA Center will be rather diffused in character. The highest presence will be that of the landscaping and created landforms, rather than of buildings, access routes and parking spaces.

Contrasts in the visual field are important for visual interest and appeal. The planned open spaces, created landforms, clutches of trees as well as the grassy areas will be strong influences in the overall visual appeal of the NOAA Center. The presence of the piers, both with and without vessels, will be a sharp contrast. Thus, while the activity of the pier area—and the vessels themselves—may have a great deal of visual interest from any viewpoint, the sharp contrast will be out of character with the remainder of the NOAA site.

As a part of a study of vessel moorage alternatives, Robert Albrecht<sup>19</sup> consulted a random selection of 40 residents who had a view of the NOAA site or a Lake Washington view. Eighty-five percent found views of vessel traffic interesting or attractive, and 72% found vessel moorage to be interesting or attractive. In addition, a mail poll of View Ridge community residents (by the View Ridge Community Club) showed that more than 60% of the residents of the View Ridge area favored a NOAA Center development along with a city park.

The new Center will involve reestablishing much of the topographical character, if not the atmosphere, of the site before it was transformed into an airport. This will be a strongly beneficial contribution to the residential character of the adjacent neighborhoods, as well as to the adjacent park and NSA facility.

#### e. Short-Term Changes in Visual Conditions

During construction of the new Center, there will be considerable visual disorder on the site. For many people this will be appealing and interesting. But construction activities and the construction equipment used, on balance, are generally considered to be adverse from a visual standpoint.

#### 6. Changes in Land Use Conditions

#### a. Changes on the NOAA Site

No zoning or comprehensive plan changes would be required for the NOAA Center. The project would meet substantially present local environmental policies. Proposed alterations of the 114 site are:

- About 70 acres of the present site is paved. NOAA Center development would increase the land available for landscaping from 44 acres to about 85 acres. In addition, a 2-acre aquaculture lagoon is planned. Of the remaining 27 acres. 18 are expected to be committed to roads, walks, parking, fire lanes and pier staging area. Buildings would occupy about 9 acres, according to present plans
- Removal of about 600 feet of presently paved shoreline and the introduction of a 1,300-foot riprap bulkhead as a part of the new pier complex. There would be a net reduction of about 700 feet of presently "soft" shoreline

<sup>&</sup>lt;sup>19</sup>NOAA Vessel Moorage Alternatives Study, Robert G. Albrecht, P. E., September 1975.

- Construction of four piers and adjacent staging area, and the berthing of 12 ships. Associated with the pier project is the removal of approximately 260,000 cubic yards of lake bottom material. The pier complex would reduce possible waterfowl and recreation use of the lake by approximately 567,000 square feet (.05 percent of the lake)
- Access corridors through the NSA and the City Park connecting the NOAA site to Sand Point Way.

#### b. Changes in Areas Adjacent to Sand Point

Immediate neighbors to the NOAA Center are the NSA and the City Park. Except for traffic corridors planning and negotiations, land use plans of the Navy, and the City Park, would not be markedly affected in adverse ways by the NOAA Center development. NOAA's plans have been adjusted to accommodate existing and planned use of the city and NSA land. Fencing, gates, landscaping plans, and topographic changes planned by NOAA would be compatible with the current and expected uses of the neighboring sites.

#### c. Changes in the Surrounding Community

Neighbors to the Sand Point site would not be significantly affected in terms of land use. There would be no significant displacement of present residential or commercial uses, and it is unlikely that the new Center will generate significant residential or commercial expansion pressures. NOAA's growth will be moderate and slow; its employees will probably continue to live in widely dispersed areas. In sum, changes on the NOAA site will be beneficial in that additional visual amenity and increased recreational and educational resources would be provided. These resources will have the effect of enhancing the present residential character of the adjacent neighborhoods. Vehicular traffic to the NOAA Center will utilize about 20% of the available capacity on arterials in the area. This increase will not be apparent in the Lake Washington Ship Canal and Lake Washington. However, the impact of this activity on water recreation and street traffic would be slight, since NOAA's vessels will be traveling at nonpeak traffic hours and largely during the offseason of recreation use of the Ship Canal and the lake.

#### d. Long-Term Changes in Land Use

Extensive modification of the NOAA site as described above would be a beneficial change in terms of land use. Many of the natural features of the site before the aviation use would be reestablished. Public access to potential recreational and educational functions of the NOAA Center will be of beneficial value to the city and to the region.

#### e. Short-Term Changes in Land Use

No short-term land use changes are likely except those planned on the NOAA site and in the NSA compound.

# 7. Changes in Transportation Conditions

#### a. Assessment of Transportation Impacts

The two effects of the NOAA Center are the increased vehicular and mass transit usage caused by the employees and visitors to the site, and the effects of NOAA vessel movements on the shipping channels and on the vehicular traffic which crosses the Lake Washington Ship Canal over the four bascule bridges. Included in the first of the two effects will also be the impact of the increased truck movement caused by the needed service to NOAA land facilities and docked ships.

Vehicular Traffic to the NOAA Site. Most traffic to the site will be generated by NOAA employees. Normally this would be close to the average employment over a year, but at the NOAA Center the number of employees at the site varies throughout the year. Many of NOAA's personnel work aboard ship, and would contribute to automobile or transit travel only when the ships are in port.

Current (July 1975) forecasts of 1981 NOAA personnel levels at Sand Point show a maximum aggregation of 1,704 employees, as follows:

Shipboard personnel	
(inactive)	375 (est.)
Education center students	400
Other employees, day shift	850
Other employees, other	
than day	79 (est.)
	1,704

Estimates of inactive shipboard personnel assume that 75 percent of the estimated crew strength (excluding officers) will be off-base while the fleet is in port. As for the education center students, it is assumed that at least one-half will be transported to and from the Center by bus.

Daily travel attributable to NOAA activities will produce an estimated maximum of 2,400 vehicle movements daily in 1981 (1,200 in; 1,200 out). The estimate is developed as in Table 24.

In the 1970-71 survey of travel patterns in the central Puget Sound region conducted by the Pudget Sound Governmental Conference, a regional persons-per-car ratio of 1.16 for home-based work trips was found. Also it was found that 5.8 percent of all journeys to work were via transit. These figures may very well have increased because of the recent fuel crisis, but this increase may be offset by the location of the NOAA site as being out of large employment areas, thus being less prone to carpools or more poorly served by public transit. Therefore, the regional vehicle occupancy ratio and transit usage percentage were assumed for this analysis. If current trends continue, both will increase in the future, so these estimates are on the conservative side.

In addition to automobile and transit trips by employees at the site, there will be visitors to the site throughout the year. In table 24 above, allowance has been made for official visitors, including vendors and jobseekers in addition to professional, educational and governmental representatives. At an estimated level of 0.3 round trips/employee, the allowance is conservative by comparison to that experience by civilian office and industrial area activities. This allowance also covers off-base trips to NOAA employees in the course of their working day.

In addition to visit trips related to NOAA's activities, some sightseer visitation is expected. NOAA estimates that the number of visitors per year may be 10,000 in the early 1980's, beginning with the first full year of Center operation in 1982. There is no data to indicate what the distribution of the visitations will be across the year, since the NOAA Center will be open to visitors only during the working day; therefore, data

TABLE 24. Estimates of NOAA-Related Daily Vehicle Movements, 1981

	NO. OF	DAILY PERSON-TRIPS		PERSONS	VEHICLE
	PERSONS	By Auto	Other	PER VEHICLE	TRIPS
Students	400	400	400	1.25	320
Other Employees, day	850	1,610	90	1.15	1,400
Other Employees, night shift	80	160	0	1.0	160
Visitors and off-base trips by employees*	260	520	0	1.1	470
TOTAL					2,350
					(say 2,400)

<sup>\*0.3</sup> round trips/daytime employee (does not include sightseers).

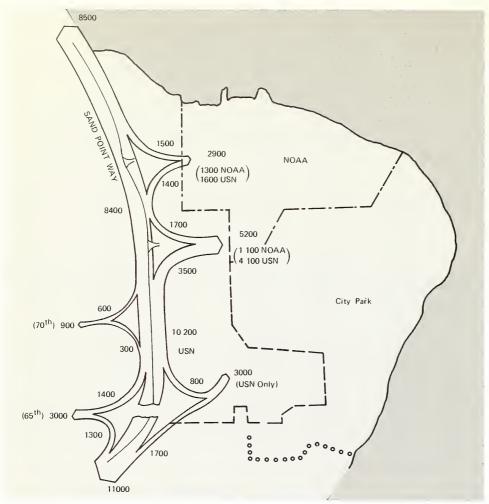


FIGURE 33. Average Daily Traffic, 1981

TABLE 25. Estimated NOAA Employee Sand Point Approach Direction

APPROACH DIRECTION	NAVY (1975 Actual)	NOAA (1975 Estimate)	NOAA 1981 (Adjusted)
North, via Sand Point Way	37%	21%	30%
West, via 65th and 70th	14%	29%	20%
South, via Sand Point Way	49%	50%	50%

for recreation areas in general cannot be used as a basis for estimation. It is assumed that the distribution of visitors on a daily basis across the year will be approximately uniform. On this basis the average number of visitors per day would be 119 in 1982. The average daily vehicle traffic attributable to these visitors, estimated as 66 vehicles/day (132 vehicle movements) is numerically insignificant compared with the 2,400 employment-related vehicle movements. Also, under the provisions of a memorandum of understanding between NOAA and the Navy, sightseers will be barred from access to or through Navy property. Provision for their access is planned as a part of the development of the City of Seattle park facilities.

The traffic generated by NOAA activities will be superimposed upon that which would be present in the absence of NOAA. The critical condition will occur when the NOAA fleet is in port in the winter months, generating the highest traffic volumes in February, prior to departure of the fleet.

Over the past 5 years, average daily traffic on Sand Point Way has been fairly constant, following a period during which a 25 percent growth took place in 5 years. An average annual growth rate of 2 percent would reflect the longer-term trend, assuming that NSA activities remain at present-day levels. By 1981, ADT could be 10-12 percent higher than currently observed levels. Historically, urban arterial traffic volumes during February are around 0.9 times the annual

average. Thus, non-NOAA traffic volumes in February 1981 can be taken as approximately equal to the 1974 ADT.

In order to determine the changes in traffic flow which will result from NOAA activities, estimates have to be made concerning the origin of the trips which arrive at NOAA, and the point at which entrance is made to the Center from the street system.

To estimate the distribution of these movements, the assumption is made that NOAA employees' residence locations will be the primary determinant. A survey of residence zip codes was compiled, covering 710 of NOAA's current Seattle area personnel. An estimate was then made of the distribution between the three principal directions of approach to Sand Point of the home/work trips of these personnel, as tabulated below. The estimate was compared with the approach distribution of Navy personnel observed currently, and adjustments made to the NOAA estimate to reflect a partial shift in the pattern of residence location as operations expand at Sand Point. See Table 25.

A new entrance from Sand Point Way will be developed in the vicinity at the present Navy north gate. The entrance will be shared by NOAA and the Navy, as will the existing main gate to the Naval Support Activity. It is assumed that no NOAA employee or official visitor traffic will use the entrance opposite NE 65th St; this may have to be re-evaluated according to the outcome of plans to develop an entrance to the city park facilities.

With these assumptions, average daily traffic on Sand Point Way, and adjoining streets will be shown on Figure 33 when the NOAA base is in operation in 1981. Differences between 1981 and 1975 volumes, attributable to the NOAA project, are summarized in Table 26.

Beyond the immediate vicinity of the project, the effect of NOAA-based traffic will be progressively smaller than the 10-20 percent increase predicted. This effect results from the dispersal of vehicle flows among a number of possible alternative routes which increases with distance from Sand Point.

An assessment was made of the traffic flows which will occur during peak periods on weekdays at the beginning and end of the normal working day. In the morning, the inbound movement of NOAA employees will generally coincide with the peak flow of traffic on Sand Point Way to the Naval Support Activity and the city. At the end of the working day, it is likely that the peak flow out of the NOAA Center will take place slightly in advance of the northbound peak flow on Sand Point Way, but will encounter flows well in excess of average.

As described above, traffic flows on Sand Point Way in February 1981 are expected to be approximately the same as annual average conditions in 1974, in the absence of NOAA. Peak flows attributable to NOAA activities are assessed as follows:

Inbound (AM Peak)

Employees: 27.5% x day shift employee

vehicle movements.

Visitors: 5% x daily visitor vehicle

movements.

Outbound (PM Peak)

Employees: 30% x day shift employee

vehicle movements.

Visitors: .5% x daily visitor

vehicle movements.

Based on these assumptions, estimated peak flows to and from NOAA are 490 vehicles/hour inbound (AM peak) and 540 vehicles/hour outbound (PM peak). Using the same assumptions relating to origin and distribution between Center entrances, estimates of hourly vehicle flow were derived and are shown on Figures 34 and 35.

The increase in peak-period traffic, attributable to NOAA is relatively greater than the increase in ADT. This can be explained by the observation that almost all NOAA activities take place during "normal office hours", in contrast to the round-the-clock activity of the Naval Support Activity and the arterial street system. The estimated changes are shown in Table 27.

Truck activity is at its peak at the NOAA site when vessels are in port. During the months of November, December and January the most vessels are in port at the NOAA Center. At these times, an estimated 17 trucks per day will arrive at the site to serve the vessels and other needs in 1980.

Transit usage by NOAA personnel is likely to be minimal, and can be accommodated within the capacity of present and anticipated METRO bus service. The level of transit service may increase in future years as a part of the implementation of the countywide system; the effect of the NOAA Center would be to encourage increased service to the Sand Point site.

NOAA Vessel Movements. NOAA vessel movements will affect waterway activities in Lake Washington and the ship canal. At present, nine vessels are expected to be active, and by the early 1980's, twelve vessels are expected to be in service. NOAA vessels (six only) made approximately 100 transits from Lake Union in 1973; in 1974 about 50 transits were made despite the fact that 3 more vessels were active. By 1980 total transits through the ship canal are not expected to exceed 150, depending on the nature of program requirements and program funding.

# b. Long-Term Changes in Transportation Conditions

Impact on Vehicular Traffic Conditions. The NOAA base at Sand Point, with a maximum employment level of some 1,700 persons, will generate up to 2,400 vehicle

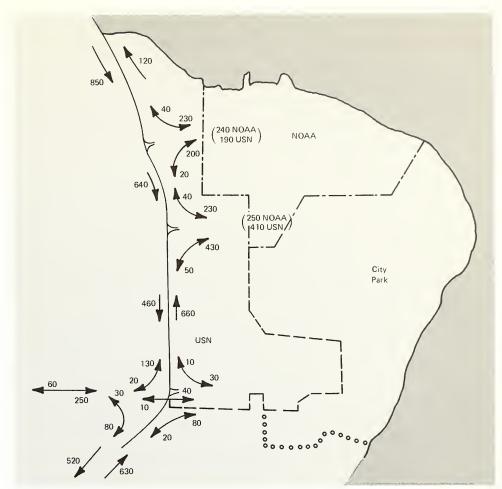


FIGURE 34. 1981 AM Peak Hour Traffic

TABLE 26. Average Daily Traffic Generated by the NOAA Center, 1975 and 1981

	1975 (vehicles)	1981 (vehicles)	Change (percent)
Average Daily Traffic:			
Entering NSA and NOAA	8,700	11,100	+27.6
Entering NSA main gate	5,700	5,200	- 8.8
On Sand Point Way, north	7,800	8,500	+ 9.0
On Sand Point Way, at 70th	8,300	10,200	+22.9
On Sand Point Way, south of 65th	9,800	11,000	+12.2
On N.E. 65th, at Sand Point Way	2,500	3,000	+20.0
On N.E. 70th, at Sand Point Way	900	800	+11.1

TABLE 27. Increase in AM and PM Peak Traffic in 1981 Due to NOAA Center Development

	1975	1981	Change (percent)
	(vehicles)	(vehicles)	
AM Peak-hour flow:			
Entering NSA and NOAA	750	1,240	+65.3
Entering NSA main gate	600	660	+10.0
Sand Point Way, north (2-way)	810	970	+19.8
Sand Point Way, south of 65th (2-way)	880	1,150	+30.7
N.E. 65th, at Sand Point Way	210	310	+47.6
PM Peak-hour flow:			
Leaving NSA and NOAA	850	1,380	+62.4
Leaving NSA main gate	550	640	+16.4
Sand Point Way, north (2-way)	870	1,060	+21.8
Sand Point Way, south of 65th (2-way)	950	1,280	+34.7
N.E. 65th, at Sand Point Way	300	430	+43.3

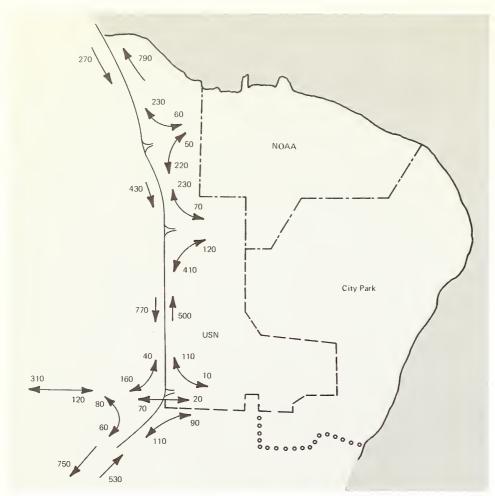


FIGURE 35. 1981 PM Peak Hour Traffic

movements daily to and from the Center. This is equivalent to 28 percent of the traffic presently generated by the Naval Support Activity, and will increase average daily traffic on adjacent streets by amounts varying from 9 to 23 percent.

Peak flow conditions, whereby the maximum hourly flow of vehicles on individual streets may increase 20 to 48 percent, will experience a more pronounced effect due to NOAA activity. The ability of urban arterial streets to pass peak traffic flows without congestion depends primarily upon the capacity of intersections to provide for conflicting movements. In the case of Sand Point Way, the installation of new entrance, a north gate, will prevent the occurrence of more congested conditions in the vicinity of the main gate to the NSA. The largest proportional traffic increase is predicted for NE 65th Street. However, the actual increase is relatively small in absolute terms and should not contribute to increased congestion. In the event that local congestion does arise, some diversion of traffic to alternative routes will occur, until the situation is

Impacts on the Mass Transit System. The only impact on the mass transit system in

the area will be the addition of about 45 riders in 1981. Since this is less than a single bus' capacity, these riders can be easily accommodated by the existing service.

Impacts on Pedestrian and Bicycle Paths. Traffic generated by the NOAA Center will have an impact on the use of the proposed Burke-Gilman Trail at the points where it intersects N.E. 65th and N.E. 70th Streets. Persons using the trail will have to stop for the passing traffic, making peak hour use of the trail inconvenient.

Impacts on Waterways and Water Facilities. In the early 1980's, a maximum of 150 bridge openings per year could result from NOAA vessel operations. Peak months of activity would be in October and November and in March and April, times when bridge openings due to recreational activity are nearer annual lows. (See Figures 28.) Also NOAA vessels would be moving during weekdays when bridge openings are at lowest frequencies. (See Figure 30.)

If all NOAA present and anticipated vessels were based on Lake Washington in 1974, annual bridge openings for NOAA vessels would be less than ten percent of the total at each of the four bridges. The NOAA vessel portion of total bridge openings at

each bridge would continue to decrease in future years because the increase in bridge openings each year is considerably greater than the expected increase in NOAA vessel movements. (See Table 20 for Ship Canal Bridge opening figures.)

Impact on waterway traffic is not expected to be significant. According to Army Corps of Engineers counts, about 70% of vessels using the Canal are pleasure craft. Because NOAA vessels move at slow speeds (four knots) and cause wakes significantly smaller than those of propeller-driven pleasure craft, there is little hazard to pleasure craft. Possible risk to pleasure craft is further reduced by the fact that most vessel activity will be between November and March, during working hours, when the fewest pleasure craft are active.

Impacts on Other Transportation Systems. No impacts are foreseen on any of the aviation facilities that use Lake Union or on any other transportation system in the northern part of Seattle.

# c. Short-Term Changes in Transportation Conditions

No significant short-term effects of the facility are anticipated. There is some possibility that during construction activities unusual traffic conditions may require special traffic routing and control for short periods of time.

# 8. Changes in Historical and Archeological Resources

No known historical or archeological resources exist on the NOAA site.

# B. POTENTIAL ADVERSE IMPACTS AND MITIGATING MEASURES

#### 1. Natural Conditions

#### a. Air Quality

Expected NOAA vessel and vehicle traffic generated by the fully developed NOAA Center would not violate air quality standards.

#### b. Climate

No changes are likely.

#### c. Water Quality of Lake Washington

Short-term adverse effects of dredging, pier construction, site preparation and lagoon excavation may be substantially mitigated by controlling the water turbidity. Such controls as dredging within the confines of a plastic water column curtain, prevention of on-land water runoff, containment on land of contaminated dredged material, and onland drying of possible high organic content dredged material will be used as appropriate. Non-polluting flocculants will be used if required to induce water clarification during the dredging process.

No long-term or secondary adverse impacts are likely.

#### d. Soils

No adverse lake bottom or on-land changes are likely.

#### e. Vegetation and Wildlife

Vegetation. No long-term adverse impacts are likely.

Wildlife. Temporary displacement of animals on the NOAA site is mitigated substantially by availability of the 212 acres to the south of the NOAA Center. Long-term displacement or elimination of a part of the present wildlife population is mitigated somewhat by NOAA plans to:

- minimize placement of buildings and human activity on the shoreline;
- maximize the use of landscaping materials over the site;
- create a protective lagoon; and
- maximize organization of on-land human activities in defined spaces, leaving adjacent areas relatively free of human encroachment.

No adverse secondary impacts are likely.

#### f. Aquatic Biota

Over the long term, the utilization of 1,300 feet of present shoreline is an adverse impact. This is compensated substantially by the addition of nearly 1,100 lineal feet of new shoreline through lagoon construction. The removal of a portion of the shallow area of Pontiac Bay is an environmental loss. Even though the benthic life can be expected to regenerate, and there are no apparent handicaps to fishery use of the pier area, the biomass cannot be expected to recover the point of matching present circumstances. Some compensation is present with the probable increase in spiney ray fishes. Still, in terms of the biological productivity of Lake Washington, removing 1300 feet of shallow area, along more than 70 miles of lake shoreline, is not a significant adverse action.

Over the short term, there will be relatively severe but localized adverse effects resulting from construction activities. These impacts can be mitigated to a great extent by controlling silting and water turbidity (see c. above). Dredging in the winter will avoid the period of highest biota presence.

No adverse secondary impacts are likely.

#### g. Sonic Quality

No significant adverse impact is likely.

#### 2. Public Utility Resources

(Liquid waste disposal, solid waste disposal, energy supply and potable water.)

Growth that is made possible by the new Center is at least in part an adverse impact. This adverse impact is balanced by the additional unique public service benefit resulting from growth and development of NOAA. Yet the growth reduces these utility resources in finite ways, which compels at least attempts to minimize the increased

demands. The following measures have been adopted by NOAA to reduce demand for these utility resources:

- A NOAA-wide carpooling program is in effect and is being expanded wherever possible.
- A NOAA electrical energy conservation program is in effect and will be extended to the new facility and expanded wherever possible.
- NOAA is an active and effective participant in heating and cooling energy conservation programs. This effort will be continued and expanded wherever possible.
- NOAA is not a significant source of solid and liquid wastes, but continuing efforts are made to reduce demands on existing waste disposal systems.
- NOAA is not a high demand water user, but continuing effort is made to minimize the demand that exists.
- NOAA meets the goals of a government vehicle use program which conserves gasoline. The program will be continued and expanded wherever possible.
- Design of the new facility will have as a high priority energy conserving design techniques. In the new Center, NOAA will utilize as much as possible no-fuel or low-fuel heating and cooling methods.

#### 3. Social Conditions

No adverse impacts are likely.

#### 4. Economic Conditions

No adverse impacts are likely.

#### 5. Visual Conditions

#### a. The Pier Complex

The proposed piers and staging area, both with and without ships, are a sharp visual contrast to the proposed on-land facility. To some observers at least, the pier complex is an adverse visual impact. Figures 36 and 37 suggest ways of using landforms, structures, and plant materials to moderate the visual presence of the pier complex. NOAA will utilize one of these, or a similar approach, which will be compatible with the overall design of the Center. An apparent majority of residents who view the NOAA site and the lake, expect to find the NOAA pier area and vessel movements either attractive or interesting. Features which increase the visual appeal of the pier area will no doubt extend the public acceptance of NOAA plans. In addition, the lagoon is of considerable visual appeal. As a visual feature of the site it would hold more interest than an equal area of undifferentiated lake.

#### b. Overall Facility Design

The avoidance or mitigation of possible visual adversity of the new Center is most usefully examined in terms of overall design as well as design detail. Since the proposed Center has not yet been designed, in an

architectural sense, NOAA design guidelines have been adopted in order to mitigate potential adverse visual impacts. Thus the site development concept presented may change in the later design phase; the guidelines will ensure that changes are visually beneficial. The following guidelines are presented without attempting to resolve conflicts among them or with other Center requirements. Resolution of possible conflicts and assignment of priorities is a part of the formal design process.

GUIDELINE 1 — Comprehensibility: NOAA will make every effort to achieve straightforward visual expression of NOAA's range of purposes and functions. Pretentious, stylistic mannerisms and other artifices will be avoided. The NOAA base will be "readable" for what it actually is, a research center.

GUIDELINE 2 — Long-Range Control: NOAA is a dynamic complex of activities; therefore, change is inevitable. Every effort will be made to inventory in advance the maximum range of possibilities for change in order to provide programmatic guides for both functional and visual design. The visual quality of the NOAA development will be such that new visual elements can be accommodated without creating visual blight, confusion, or excessive disorder.

GUIDELINE 3 - Landscaping: Generous plantings of trees and shrubs are essential to visual and environmental amenity, and can be designed to augment rather than confuse or camouflage the appealing visual images of the NOAA base. Landscaping will be a mixture of formal and informal styles. Screening of parking lots as suggested in Figure 38 would require linear or formal plantings of trees; tree planting areas at the outer edge of the staging apron would also be formal. Yet development of informally landscaped areas using native plants would be necessary for encouraging wildlife uses of the site.

GUIDELINE 4 – *Scale*: Careful study will be undertaken to determine appropriate scale or scales. Over-scaling and monumentality will be avoided. Figures 39 and 40 illustrate one approach to setting an appropriate scale.

GUIDELINE 5 — Visual Continuity: The design of the NOAA development will feature themes compatible with the proposed city park and Naval facility. Reference points are:

- Minimization of physical and visual conflicts between the NOAA Center and NSA, and between the NOAA Center and the city park.
- Maximum use of opportunities for reciprocal vistas and visual corridors between the NOAA Center and the park and NSA.

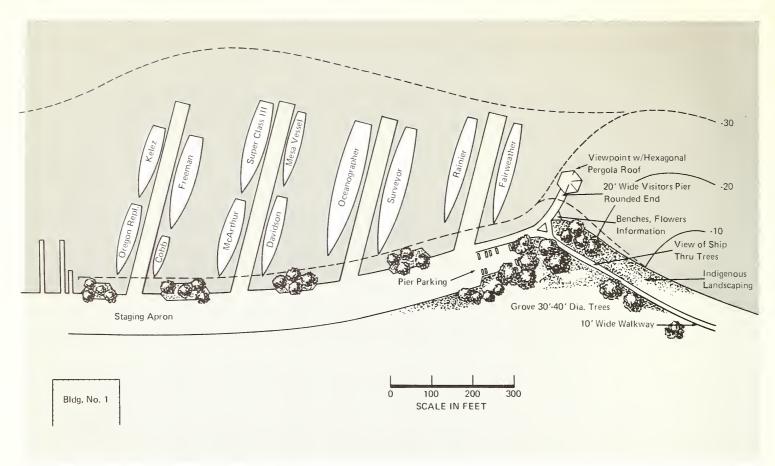


FIGURE 36. Pier Area Visual Amenity Example #1

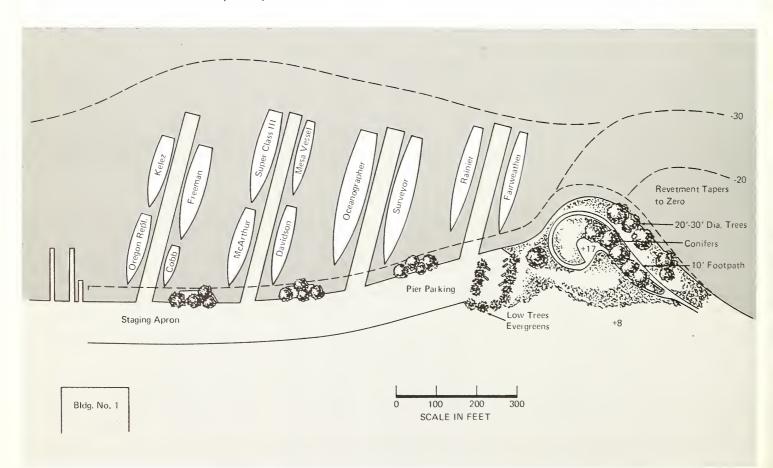


FIGURE 37. Pier Area Visual Amenity Example#2

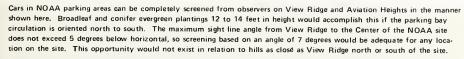
- Use of building materials and site plan features which represent the best of the character of the city park and NSA.
- GUIDELINE 6 Visual Integration: The visual relationship between NOAA buildings and site development and the pier complex will be given careful study. Key reference points are:
- Ships are a mixture of scales and visual elements. A great deal of the human interest in ships stems from these visual features. NOAA buildings, while not needing to look like ships, will nevertheless reflect a similar richness in visual elements and scale variations.
- NOAA ships are white. The NOAA buildings might utilize white as well as other compatible colors in order to maximize

- color harmony throughout the Center.
- Buildings will be arranged to relate sensitively to the pier complex. Earth forms will be utilized wherever possible to enhance the visual interest of the Center.
- Landscaping with earth forms as well as plant materials will be used to provide a visual transition to the staging area and the piers and to moderate the visual contrast of the pier area. (See Figures 36 and 37.)
- GUIDELINE 7 Compatibility of Access Routes: Present plans are to develop both a north gate and a main gate vehicular entrance to the NOAA Center. The entrances will be landscaped to complement the NSA facility as well as to serve as a visual extension of the NOAA develop-

- ment. Appropriate pedestrian and vehicular access from the city park will be arranged with city officials.
- GUIDELINE 8 Residential Visual Presence: The NOAA Center will be seen from parts of View Ridge, Aviation Heights, Fairway Estates, and Windermere. Overall design of the Center and its landscaping will maximize the visual presence of landscaped features of the site rather than buildings, roads, parking areas, and the pier complex.
- GUIDELINE 9 The NOAA Center as a Landmark: Across the lake, to the north and to the east, the NOAA vessels will be a visible but distant landmark. Consideration will be given to creating a significant on-land landmark, such as a public observation tower, which would also permit views of distant and nearby activities.

#### 6. Land Use Conditions

There are no adverse primary or secondary land use impacts likely in the adjacent areas or the surrounding community. On the NOAA site, the pier complex would preempt about 567,000 square feet of the lake surface, thereby restricting most present or potential recreational or wildlife use of this space. Public facilities made available, such as ship viewing and touring, will be attractive features of the pier complex, which also mitigates the technical displacement of activity on .05 percent of the lake.



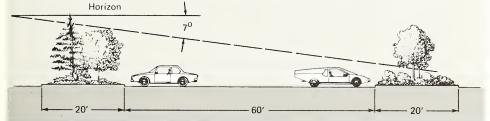


FIGURE 38. Parking Area Visual Screen Example

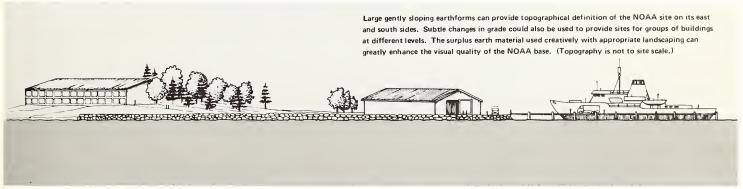


FIGURE 39. Scale Illustration #1

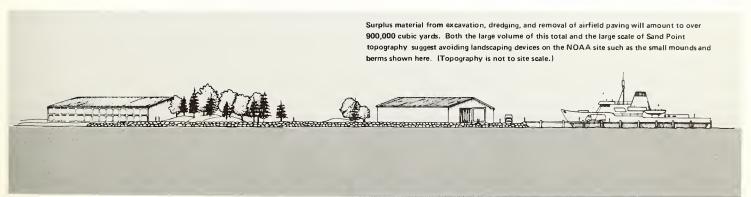


FIGURE 40. Scale Illustration #2

Overall, the NOAA use of the site could be considered adverse if beneficial use could be only "natural" such as existed in part before the aviation use was established. Or, if a public park were considered to be a more beneficial use than the NOAA Center, the NOAA use could be considered an overall adverse land use impact. The arbitrary application of such judgments is mitigated in large part by the fact that the NOAA activity would be a unique recreational and educational complement to the regional park being planned by the city. In addition, substantial amounts of the atmosphere as well as the landforms and vegetation of the pre-aviation site will be reestablished along with the development of the NOAA Center.

#### 7. Transportation

The use of a transportation facility by an amount of traffic which is not more than the facility's capability does not, of itself, result in an adverse impact. Adverse impacts arise only if the traffic causes congestion, delay, increased risk of accidents, deterioration in air quality, heightened noise, or disruption caused by the construction or modification of the transportation facility.

Although NOAA activities will generate a significant volume of vehicular traffic to and from the Sand Point base, the volume will not be so large as to result in congestion on the various routes by which the base may be approached. Any incipient tendency for congestion to occur on the relatively constricted cross-town streets, e.g. NE 65th, will be moderated as road users utilize alternative routes.

On Sand Point Way, there is the potential for congestion in the vicinity of the entrances to the Naval Support Activity. The proposed access scheme, involving an additional entrance available for use by Navy and NOAA personnel, should be effective in preventing the occurrence of congestion. Traffic signals at the North Gate entrance. and possible renovation of the signals at the present NSA main gate, will be required to assure expeditious movement of vehicles. In the event that one of the entrances is under-utilized, with congestion occurring elsewhere, there will be a natural tendency for drivers to adjust their travel patterns (timing and selection of gate) to restore a balance. If this does not occur, the situation can be mitigated by instituting a control system whereby base employees' cars may use only one of the available gates.

The impact of increased traffic volume on air quality has been discussed above; the effect on ambient noise levels will be in the order of a 1 decibel increase, barely perceptible to the observer. Construction activities affecting off-base roadways will be limited to signal installation and channelization at the entrances, and will not affect normal traffic flow.

The increase in bridge openings due to NOAA ship movements will have some effect on the flow of road traffic crossing the bridges during the periods of weekday peak traffic flow. NOAA vessels operations in the ship canal are presently restricted to mid-morning and mid-afternoon week day periods, which is a substantial adverse impact avoidance.

There are no other significant transportation impacts.

# 8. Historical and Archeological Resources

No significant adverse impacts are likely as a consequence of the NOAA Center development.



NOAA Ship Davidson

#### PART V

# Benefical Impacts and Unavoidable Adverse Impacts

#### A. BENEFICIAL IMPACTS

#### 1. Natural Conditions

- Net reduction of about 40 acres of paved area and reduction of surface runoff into the lake. Achievement of about 85 acres of landscaped area and outdoor work space would encourage wildlife use of the area.
- Reestablishment of natural landforms, increasing the visual amenity of the site.
- Probable increase in spiny ray and soft ray fishes as a result of increase in mosses and algae on pilings and revetment.
- Establishment of a two-acre lagoon, adding nearly 1,100 feet of lake shoreline which increases the productivity of the lake as well as the visual appeal of the site and the proposed development.

#### 2. Public Utility Resources

No clear benefits accrue as a result of the NOAA Center development.

#### 3. Social Conditions

- Significant addition to community, city and regional education and recreation resources.
- Increase in community and city pride in research and scientific service resources.
- Contribution to the enhancement of residential atmosphere in the Sand Point community.
- Contribution to growth and development of resources available to the University of

Washington for study of Oceanography, Meteorology and Marine Sciences.

#### 4. Economic Conditions

- Potentially \$65 million new local expenditures for materials and services for the new facility.
- Long-term increase in NOAA employment resulting in \$19 million projected additional personal income in the State.
- Catalyst for growth of science-based private business in Seattle.

#### 5. Visual Conditions

Through careful facility design, major enhancement of the visual interest and appeal of the site as well as adjacent NSA, proposed park and residential areas.

#### 6. Land Use Conditions

- Enhancement of present desirable residential land use features of the area.
- Reestablishment of public access to the site.

#### 7. Transportation Conditions

- Encouragement and support for an increase in public transit service to the area.
- Establishment of a destination of interest to users of the proposed Burke-Gilman Trail.

#### B. UNAVOIDABLE ADVERSE IMPACTS

#### 1. Natural Conditions

• Short-term, localized lake turbidity gener-

- ated by dredging and site excavation.
- Short- and long-term displacement and possible elimination of some birds and land animals. (No rare or endangered species are involved.)
- High short-term adverse impact on aquatic habitat due to localized water turbidity and lake bottom changes. Relatively insignificant long term reduction in shallow water aquatic life.

#### 2. Public Utility Resources

Marginally significant long-term cumulative increase in demand for energy, potable water and waste disposal services.

#### 3. Social Conditions

No unavoidable adverse impacts are likely.

#### 4. Economic Conditions

No unavoidable adverse impacts are likely.

#### 5. Visual Conditions

No unavoidable adverse impacts are likely.

#### 6. Land Use Conditions

Marginally significant (.05 percent of the lake) displacement of present use of Lake Washington by the NOAA pier complex.

#### 7. Transportation Conditions

Some overall increase in Sand Point area traffic, of minor significance.

### 8. Historical and Archeological Resources

No unavoidable adverse impacts are likely.

#### PART VI

# Relationship Between Short-Term Uses and Long-Term Productivity

Standards for long-term productivity of the site have two reference points. The first is the character of the site before the aviation use, described in Part III, B "Condition of the Site, Circa 1920". The second reference is the surrounding urban residential setting. These references are in sharp conflict; the natural flora and fauna of the historical circumstances probably could not be fully reestablished in the present urban residential context. Moreover, the high quality of the residential character of the area is probably a more highly desirable urban environmental resource than the historical natural elements. Consequently, the standard of productivity for the site is that of maintaining and enhancing the residential quality of the area, using the approach of maximum rehabilitation of the historical conditions of the site.

The proposed NOAA use of the site

meets this standard, while meeting agency requirements for consolidated facilities. The NOAA use will reestablish the basic natural landforms of the site; reestablish some of the historically characteristic vegetation and atmosphere; and reestablish public access to the site for the purpose of examining and enjoying a unique collection of research and scientific service activities while complementing features of the surrounding community and adjacent developments.

In terms of overall environmental costs and benefits, the proposed rehabilitation of the site is a substantial long-term environmental gain, locally and regionally; and the benefit accruing to NOAA from consolidating and enlarging its activities on the site is a substantial national gain for the broadbased environmental research undertaken by NOAA components. Against this sets the

environmental costs which are small and largely short-term. (See Part V, B.)

In sum, the proposed development poses no significant short- or long-term threat to public health or safety; there are no hazards to unique or endangered species of flora and fauna; and there are no significant adverse impacts on neighborhood quality. To the contrary, the proposed development represents a timely opportunity to add substantially to the effectiveness of a key environmental agency along with accomplishing an unusual, large-scale rehabilitation of an important regional human environmental resource. The environmental costs of this effort are insignificant in terms of the human environment, and the costs to the natural environment are low on the short term and a net benefit in terms of long-term environmental quality of the site.

#### **PART VII**

# Irreversible and Irretrievable Commitments of Resources

Approximately \$65 million of public funds would be committed to the project if it is approved. In terms of natural resources, the commitments of 1,300 feet of shoreline to pier uses and the removal of a biologically productive shallow area are not easily recoverable. Long-term displacement or elimination of some on-land wildlife is probably not an easily reversible action. The commitment of the site to new buildings and new landscaping would make the possibility of aviation use of the existing pavement practically irretrievable.

#### PART VIII

# Comments and Responses

The DEIS was published for formal comment on January 31, 1975. Comments were received through March 17, 1975. On February 22, 1975, NOAA held a public meeting in Seattle to receive comments on the DEIS and to answer questions related to the DEIS and the NOAA Center project. Comments were requested from the agencies and groups listed below. Comments were received from those marked with an asterisk. Other organizations and individuals responding are italicized.

#### **FEDERAL AGENCIES**

\*Department of Agriculture Department of Defense

\*U.S. Army Corps of Engineers

- \*U.S. Navy, Commandant, 13th Naval District
- Office of Chief of Naval Operations, Washington, D.C.
- \*Department of Health, Education and Welfare
- \*Department of Housing and Urban Development
- \*Department of the Interior

Bonneville Power Administration

Bureau of Outdoor Recreation

Fish and Wildlife Service

National Park Service

Office of Land Use and Water Planning U.S. Geological Survey

Department of Labor

Occupational Safety and Health Administration

Department of Transportation

- \*Federal Aviation Administration
- \*Federal Highway Administration
- \*U.S. Coast Guard
- \*Energy Research and Development Administration
- \*Environmental Protection Agency Office of Economic Opportunity Federal Power Commission General Services Administration Water Resources Council

#### STATE AND REGIONAL AGENCIES

Office of the Governor

- \*Washington State Department of Ecology
- \*Washington State Aeronautics Commission
- \*Oceanographic Commission of Washington

- \*Washington State Office of Program Planning and Fiscal Management
- \*Washington State Department of Fisheries Washington State Department of Natural Resources
  - Washington State Department of Social and Health Services
- \*Washington State Department of Game Washington State Office of Community Development
- Washington State Parks and Recreation Commission
- Washington State Interagency Committee for Outdoor Recreation

University of Washington

- \*Puget Sound Air Pollution Control Agency
- \*Puget Sound Governmental Conference
- \*Municipality of Metropolitan Seattle (METRO)

#### LOCAL AGENCIES

King County Executive

King County Council President

\*King County Planning Department

King County Parks Department

King County Department of Public Works

\*Mayor, City of Seattle

President, City of Seattle Council

Jeanette Williams, Councilperson, City of Seattle Council

- \*Director, Seattle Department of Community Development
- \*Economic Development Council of Puget Sound
- \*Superintendent, Seattle Parks and Recreation Department

City of Seattle Board of Park Commissioners

Seattle City Engineer

Port of Seattle

Batelle Northwest

## VOLUNTEER GROUPS AND INDIVIDUALS

Sierra Club

King County Chapter, Washington State Environmental Council

Friends of the Earth

- \*View Ridge Community Club
- \*Hawthorne Hills Community Club
- \*Windermere Corporation

Laurelhurst Community Club Inverness Community Club

\*League of Women Voters

Aircraft Owners and Pilots Association Sand Point Air Park Association

Haller Lake Improvement Club

Audubon Society

Laurelhurst Beach Club

Lake City Chamber of Commerce

Montlake Community Club

Friends of Sand Point Park

Belvedere Terrace Community Council

Aviation Heights Community Club

Virginia Burnside

Scott L. Smith

Elizabeth Sherris

Lloyd C. Orlob

Jack C. Sweek

Wheeler C. Grey

Pat Emerson

Ed Server

The following individuals asked questions about NOAA plans and received answers at the public meeting held for receiving comment on the DEIS.

 $For rest\ Lewis$ 

Bill Endicott

Harold Stack

Paul Locke

Paul Blomberg

Faut Blomberg

Roy Nelson

#### FEDERAL AGENCIES

#### Soil Conservation Service, USDA

Comment: USDA finds the draft to be very

complete and well done. *Response:* Acknowledged.

Comment: The facility's impact on the population of ring-necked pheasants at Sand Point should be covered more fully and a discussion included in the Final EIS.

Response: There remains considerable question as to the continued presence of pheasants in the NOAA portion of the site. Most of the ground cover and feeding areas of any attraction to the pheasants lies in the city park portion of the site. But, assuming that there are 15-20 pheasants on the NOAA site, the NOAA Center development and operation will probably displace or eliminate most if not all pheasants.

#### U.S. Army Corps of Engineers, DOD

Comment: A permit is required from the Department of the Army for all construction activity waterward of the high water line (21.8', Corps of Engineers DATUM) in Lake Washington. A permit is not required if Congress has approved the exact location and plans from which they could have considered the effect on navigable waters of the United States, or that they intended to exempt NOAA from the requirements of Section 10.

Response: Acknowledged.

### U.S. Navy Thirteenth Naval District, DOD

Comment: The DEIS proposes primary access through the Main Gate of the Naval Support Activity, Seattle, with truck and other ship service vehicles utilizing the North Gate (page 13). It also proposes widening 4th Street from the existing two lanes to four lanes with a median strip (page 13) and possible removal of the Gate House and relocation of the fire station (page 46). The estimated number of visitors to the NOAA facility is stated (page 48) as being 30,000 per year. The DEIS does not mention a security fence between the NOAA facility and NAVSUPPACT which, for Navy security, is a condition of the property disposal action.

Greater use should be made of the North Gate access route to reduce traffic congestion along 4th Street and, for Navy security reasons, general sightseers to the NOAA facility cannot be permitted to traverse through the Naval Support Activity. The Navy requires the use of the Main Gate House building and does not favor relocation of the fire house or other modifications to 4th Street.

#### Office of Naval Operations, DOD

Comment: This office concurs with the comments of the Commandant, Thirteenth Naval District.

Response: After additional studies and discussions with the Navy, a satisfactory solution has been reached which is summarized as follows: NOAA will not remove the Main Gate House building or relocate the fire house. NOAA will more fully develop the North Gate/1st Street access route. Official visitors to the NOAA facilities and some NOAA employees will use the Main Gate/4th Street access route. The remaining NOAA employees, all truck traffic and vendors will use the North Gate/1st Street route. NOAA will work with the City of Seattle to provide an access through Sand Point Park to the NOAA Center for sightseers. NOAA will construct a security fence between the NOAA site and the NSA and work with the Navy on administrative procedures that will minimize traffic congestion and maintain the required security integrity of the Navy's installation.

## Department of Health, Education and Welfare

Comment: The DEIS fails to mention the degree of human foodstuffs which are taken from Lake Washington and the effects of the proposed facility on biota used for human foods.

Response: Information on human foodstuff taken from Lake Washington on a commercial basis is unavailable. Private and recreational foodstuff taking is acknowledged; potential effects are identified in the water quality and aquatic biota sections.

# Department of Housing and Urban Development

Comment: The DEIS adequately covers most of HUD's areas of concern.

Response: Acknowledged.

Comment: In view of energy conservation, there may be a need to reexamine the DEIS assessment on housing as the assumption that only 25% of employees would migrate to the area may be low.

Response: Reexamination of this estimate did not reveal a basis for changing the figure. The substantial attraction of numerous housing choices and relatively low costs of housing in east and north residential areas seems likely to mitigate the force of fuel shortages toward possibly more expensive housing choices in the Sand Point area. Instead, fuel shortages are more likely to stimulate car pooling and use of public transportation, according to recent experience.

Comment: The cost of housing in the Sand Point area is expensive, thus the type of employees may be a significant factor on migration.

Response: Housing costs in the Sand Point area are relatively high as compared to south and west areas in Seattle and in north suburban areas. This fact would tend to cause a continuation of considerable dispersion of NOAA employee residences away from the Sand Point area.

#### Department of the Interior

Comment: The DEIS appears well written and comprehensive. Most areas that the USDI has jurisdiction over are adequately discussed.

Response: Acknowledged.

Comment: The Final EIS should stress close coordination with the City of Seattle Parks Department to assure compatibility of uses and maximization of public recreation opportunities.

Response: Coordination commitments with the City of Seattle Parks Department are discussed in Part III.A.

Comment: Page 13, Dredging and Bulkhead Construction. The possibilities that a two acre lagoon as described could become a trap for migrating anadromous fish and/or a

pollution trap for wastes from aquaculture activities should be discussed under Part IV, Environmental Changes and Mitigating Measures for Potentially Adverse Impacts.

Response: Acknowledged. Prevention of possible trapping of migrating fish or aquaculture wastes is a matter of lagoon general design criteria and will be dealt with during the lagoon design process.

Comment: Page 20, e., Vegetation and Wildlife. The Final EIS should discuss the project's impact on the pheasant population at the site and what measures will be taken to protect them and their habitat.

Response: This is discussed under Department of Agriculture comments.

Comment: Page 21, The Shoreline Habitat. The results of a NMFS Survey (Page 79, Exhibit L) seem to conflict with the Nishimoto publication and two other widely circulated public documents which have identified the Lake bottom area around Sand Point as areas of anadromous fish use. These differences should be reconciled in the Final EIS.

Response: Aquatic biota studies for NOAA completed since the publication of the DEIS indicate that the Sand Point area is used by anadromous fish. The NMFS survey was not intended to be a comprehensive report of the fishery circumstances, but rather a preliminary survey.

Comment: Page 42, e., Vegetation and Wildlife. This section implies that displaced wildlife inhabit and survive in other areas. Most displaced wildlife would be lost because surrounding habitat is at or near its carrying capacity and would not support additional animals.

Response: Acknowledged.

#### Federal Aviation Administration, DOT

Comment: Part VII, Page 55, Irreversible and Irretrievable Commitments of Resources. The most critical impact of the proposed NOAA Headquarters at Sand Point is the irretrievable nature of the proposed alteration of this aviation resource. The geographical location, size, environmental conditions and present runway configuration at the site make it a resource of unique value to the aviation system, and it will be irretrievable once the NOAA Headquarters are erected.

Response: The DEIS and this document note that the NOAA development would probably make aviation use of the site irretrievable.

Comment: Page 53, Item g., Historical and Archeological Resources. Sand Point as a general aviation airport has historical significance. Mr. Boeing flew his first airplane from this facility and the first round-the-world flight began and terminated at Sand Point. Response: The historical events are acknowledged. However, there are no existing

nor reasonably restorable unique physical vestiges of these events on the NOAA sitc.

Comment: There appears to be no structure in the proposed development that would adversely affect the airspace or would require notice in accordance with Federal Aviation Regulation Part 77.

Response: Acknowledged.

#### Federal Highway Administration, DOT

Comment: Highway transportation impacts are adequately addressed in the statement. Response: Acknowledged.

#### U.S. Coast Guard, DOT

Comment: Page 6, Table 2, Site Alternatives and Effectiveness Assessments, Item 13, Lake Union. The Coast Guard has no facilities on or adjacent to the present NOAA Lake Union facilities. The nearest facility is some four miles from the identified alternative Lake Union site.

Response: This error has been corrected. The Lake Union facility mentioned is a Navy Reserve Training Center.

Comment: Page 11 and 13, Pier Construction, Vessel Operations and Pier Activities. The DEIS should discuss future dredging requirements of the Lake Washington Ship Canal or adjacent areas as well as possible effects of this dredging and associated additional vessel traffic.

Response: NOAA use of the Ship Canal and adjacent areas does not require further dredging. Normal maintenance of the present Canal conditions is adequate for NOAA vessel movement.

Comment: Page 14, "Routine Maintenance of NOAA ships...", The 13th Coast Guard District files show a considerable number of cited Refuse Act violations such as paint, paint chips, sandblasting material and material falling into the water.

Response: A few violations have occurred, but none of significant adverse effect on water quality or aquatic biota. The new pier facility at Sand Point will enable better surveillance and prevention of such accidental violations of the Refuse Act.

Comment: Page 14 ... "There were five accidental petroleum liquid spills attributable to NOAA..." The Federal Water Pollution Act as amended in 1972 (33 USC 1321) prohibits virtually any discharge of oil or hazardous substance into the waters of the United States.

Response: The meaning of the Federal Water Pollution Control Act is acknowledged. NOAA has and will continue to make every effort to meet or exceed the standards of the Act. Plans for achieving this objective are expressed in Part III A.

### Energy Research and Development Administration

Comment: The proposed action will not

conflict with any program subject to control by ERDA.

Response: Acknowledged.

Comment: Exhibit I of the DEIS, Bird Species Obscrved at Sand Point. Correct spellings of sixteen bird species, add Northwestern Crow and substitute Dark-eyed Junco for Oregon Junco.

Response: Spelling of species has been corrected in accordance with "Washington Birds," Larrison & Sonnenberg. Northwestern crow has been added.

#### **Environmental Protection Agency**

Comment: The DEIS appears quite adequate although impacts on aquatic biota from dredging, pier construction and pier use are not presented. The EPA assumes this will be included in the final statement, but will the study results be available to EPA biologists before release of the statement? Response: Results of the year long aquatic biota study are included in the present document. Advance copies of the study have been provided to Region X EPA staff.

Comment: Comments on the DEIS have been classified LO-1 (LO-Lack of Objection, 1-Adequate information), and will be published in the Federal Register in accordance with Section 309 of the Clean Air Act.

Response: Acknowledged.

#### STATE AND REGIONAL AGENCIES

## Washington State Department of Ecology

Comment: Page 21 of the Lake Washington Regional Shoreline Goals and Policies states that "Moorage, storage, servicing and operation facilities for ocean-going or commercial ships and barges should not be expanded on the shoreline of Lake Washington." Several local jurisdictions with completed master programs have reflected this policy although Seattle's program has not yet been submitted. Even though this report is discussed briefly on page 34 of the DEIS, the unresolved question of ship moorage is not mentioned. This oversight should be corrected in the Final EIS and conflicts presented for consideration.

Response: Reference to the Regional Committee recommendations is acknowledged. However, City of Seattle policies allow certain kinds of research and education related development on Lake Washington. There is conflict in the recommendations of citizen committees. NOAA seeks to comply with the most immediate and relevant local policies, which are those of the City of Seattle.

Comment: Since Lake Union's shoreline is already commercially oriented, the threat of NOAA ships moored there is much more tolerable than the threat of Lake Washington moorage facilities. Our files contain several instances of accidental pollutant discharge at the current Lake Union facility.

Response: NOAA vessels, like the proposed research center, are not commercial activities of the quality that exists on Lake Union. Ship yards, concrete product establishments, seaplane terminals, a used household goods recycling station and such which exist on Lake Union are not activities which contribute to the atmosphere of a major research center. Moreover, EIS studies have indicated that the NOAA Center at Sand Point would not pose a significant environmental threat to the Sand Point area. NOAA acknowledges the occurrence of accidental pollutant discharges; more adequate facilities for vessel berthing at Sand Point will minimize this danger. See Part III A and Part IV A which analyze these issues.

Comment: In light of the Regional Citizens Advisory Committee's findings and the possibility of alternate moorage sites, any pollution control that might be involved would be of interest to the Department of Ecology. Response: NOAA's plans for Sand Point include a full range of commitments for water quality controls. Reviews and comments on these commitments have not produced practical suggestions for their improvement.

Comment: The paired-comparison scheme (pages 5-9) should include analysis of the split-site alternative. This alternative's dismissal on page 7 is not well substantiated. Positive facets of the split-site alternative might include:

- a. Easy land access from Sand Point to Lake Union.
- b. Without ships, the Sand Point facility could be designed to enhance shoreline location and provide public access.
- c. It is more direct to Puget Sound from Lake Union with fewer bridge openings.
- d. No precedent would be set for additional ocean-going vessels in Lake Washington.
- e. No dredge/fill required in Lake Washington.

Response: Analysis of the split-site alternative has been included. See page 10.

### Washington State Aeronautics Commission

Comment: The DEIS does not consider the historical events in aviation which have taken place at Sand Point.

Response: This statement acknowledges historical aviation events at Sand Point. See Part III.

Comment: Page 1, Summary, number 2, Long Term Impacts, Water Quality, "No adverse conditions on water quality are likely under these conditions..." The Final EIS should include a positive firm stand on this.

Response: Based on DEIS Studies, there is a very low probability of water quality damage to the lake as a result of the NOAA

development. METRO technical evaluation of the information corroborates this water quality impact assessment.

Comment: We are concerned with the high probability risk factor of oil spills in Lake Washington due to the size and type of vessel that will be berthed there.

Response: As indicated in Part IV A, there is not significant danger from NOAA activities of petroleum liquid spills that would be damaging to aquatic biota and to Lake Washington water quality.

Comment: Page 3, D, Column 1, Visual Conditions, "the sharply increased visual appeal of the site will enhance the attractiveness of the surrounding neighborhood..." It is difficult to believe that an ocean-going vessel with piers and equipment could be appealing to any surrounding neighborhood. Response: A sampling of resident views indicates that 72% of residents who can see the NOAA moorage area expect views to be favorable. In addition, 85% of the residents who could see NOAA vessels moving on Lake Washington expect views to be favorable. The contention by the commission is not supported by this sampling of resident judgements.

Comment: Proper disposal of sewage and waste from vessels must be insured 100% at all times.

Response: NOAA plans are based on this principle.

Comment: Residents of Lake Washington are quite limited in the size of pleasure docks allowed. Rules and regulations that apply to residents should apply to the Federal Government.

Response: The governmental principle suggested would tend to restrict Federal Government purposes to the level of private residential purposes. If this principle were applied, there would be no reasonable allowance for national defense, for regional planning and services or for environmental protection and management. Understandably, the notion presented has little currency as a principle in governmental theory or practice.

Comment: Page 7, paragraph C, third column, states "were the Sand Point site unavailable to NOAA, they would abandon the facility consolidation project altogether and remain at present facilities." Why does NOAA need all of Sand Point as opposed to a multiple site use concept as proposed by the Washington State Aeronautics Commission?

Response: NOAA has found that building a major research center next to a noisy and hazardous airport would prevent realization of the purposes of the research complex. Much of the research activity would have to be structured to avoid aviation noise and safety hazards rather than to satisfy NOAA research purposes.

Comment: Page 7, column 3, number 2, a, Alternative Uses of the Site states, ...if NOAA abandoned their plans for development or Federal funds were withheld, the site would then remain unused and in its present condition as part of the former Naval Air facility... Did NOAA consider the site's use as an extremely valuable airport or did they think no one else would be interested in the property? What happens to the views and concepts shown by the multiple use proposal?

Response: One of the bases of NOAA's consideration of the site was the position of the City of Seattle against an airport, thus allowing both the space and atmosphere required for a major research and scientific service center. The value of the site as an airport has not been denied. What has been denied by the City is that the airport use is of higher value than a park and a NOAA Center.

Comment: The statement on Page 10, column 1 that an aviation facility would sharply reduce the potential environmental quality of the NOAA facility and a city park by visual blight, noise and accident hazards is inaccurate and incorrect.

Response: Research findings for this statement indicate that airport visual blight, noise and accident hazards would be a very substantial handicap to the development and functioning of the NOAA Center.

Comment: Page 13, column 2, Access and Parking, paragraph e., are the people along Sand Point Way ready for a traffic load of about 800 automobiles from the NOAA facility?

Response: Traffic studies indicate that NOAA generated traffic will not have a substantial impact on Sand Point Way traffic. See page 53.

Comment: Page 14, column 2, ...routine maintenance of NOAA's ships is presently undertaken at pierside on Lake Union... To say that in most cases a majority of the chemically inert chips and powder from the ships is recovered before falling into Lake Union is as unreasonable as saying aviation is a visual blight.

Response: A sensible comparison of the effects of repainting NOAA vessels and the visual blight of several hundred acres of airport paving, hangars, and high fences is hard to conceive. Perhaps some other point was intended.

Comment: Page 24 of the DEIS states that fuel for NOAA's vessels is usually purchased through Navy contract. Availability will vary with allocation as priorities affect the Navy in this region. With the serious energy shortage, is it wise for NOAA to spend taxpayer dollars to develop Sand Point when there is no place where they have arranged for long term contracts to provide them with fuel?

Response: NOAA does have long term contracts with the Navy for fuel. If fuel is scarce, the Navy could not provide the fuel according to contract. No other meaning was intended by this statement in the DEIS.

Comment: The DEIS repeatedly tries to discredit aviation. It appears questionable that NOAA would even want such a facility and appears that NOAA was forced into the position by political figures. The usage of Sand Point for NOAA is a disastrous move, costly to construct and maintain.

Response: Nothing in the DEIS was intended to discredit aviation. The focus of NOAA's consideration of aviation matters was on the narrow issue of the possible location of an airport at Sand Point. Plans and support for the NOAA Center have been extensive. There has been considerable political support for NOAA's plans at Sand Point; however, the planned NOAA Center has well substantiated justification in terms of NOAA requirements and mission as a federal agency. See Part II.

### Oceanographic Commission of Washington

**Comment:** In general, the DEIS is of excellent quality, and it reflects a sensitivity for the environment.

Response: Acknowledged.

Comment: The public awareness effort regarding oceanographic and meteorologic programs and activities should be of high priority. Plans for a visitor's center and regularly scheduled, guided tours of NOAA facilities are good.

Response: Acknowledged.

Comment: Aspects of the plan such as automobile traffic, shipping activities and the boundary between NOAA and the city park require close liaison with the city and state.

Response: Liaison arrangements have been completed. See Part III.

Comment: The overall benefits of the project far outweigh costs to the environment and the citizens of the nation.

Response: Acknowledged.

### State of Washington Office of Program Planning and Fiscal Management

Comment: There is no other suitable location with adequate level ground, lack of obstructions, convenient access and favorable environmental conditions which could be used as a general aviation facility without costing more than Seattle, King County, and the State could afford, even with federal assistance. This should be given consideration in the Final EIS.

Response: This circumstance would be most properly a matter for EIS studies of airport location alternatives, should such studies be undertaken.

Comment: NOAA's findings that their activ-

ities cannot be conducted in proximity to a general aviation facility will result in the destruction of existing facilities. The EIS should comment further on the possibility of developing the acres released by the Naval Air Station into a municipal park incorporating a general aviation facility.

Response: NOAA plans probably will preclude the utilization of the runway for aviation purposes. The matter of a park is most appropriate for the environmental impact study of the city park.

Comment: The Final EIS should clarify how NOAA intends to "fence off" its complex from the proposed city park.

Response: With the advice and assistance of City Park planners, NOAA plans a curvilinear below grade fence, masked with plant materials. See Figure 12.

Comment: The Final EIS must consider future requirements for the NOAA site in view of estimates of growth, and the possibility of eventual encroachment on the park area itself.

Response: NOAA has used a planning horizon of about five years in setting plans for the present development. If additional growth occurs beyond the level this statement is based on, it will be of necessity the subject of future impact studies. There is no basis on which to expect eventual NOAA encroachment on the park area.

Comment: Construction of a complex of piers and office buildings appears incompatible with adjacent park and residential districts and will have a substantial impact on these areas and existing shoreline. The State has serious concerns about the creation of a marine terminal in Lake Washington which might better be suited near other industrial facilities.

Response: The suggestion that the NOAA Center is incompatible with a park and the surrounding residential areas has not been sustained by EIS studies and document reviews. Site alternative studies establish that the Lake Washington site is the most cost effective for NOAA while causing no significant adverse impacts. The suggestion that the NOAA Center is not suitable for Lake Washington awaits factual support information that has not been forthcoming.

Comment: The use of Lake Washington by ocean-going vessels is unlikely to enhance its use for any other purposes, particularly recreation.

Response: NOAA vessels are visually appealing to a large number of people. This is true of state ferries, fishing vessels, commercial vessels and recreational boats and is sustained by the fact that many Seattle residents choose to live where vessel activity views are available. Consultation with residents who can see the NOAA site and who have lake views, indicates most people will find NOAA vessels and piers interesting or attractive.

Restaurants and other commercial establishments profit from such views as well. NOAA vessel movements pose no significant handicap to recreational activity on the Lake, and consolidation of NOAA Center activities at Sand Point would be a substantial recreational and educational resource to the adjacent park. No reliable information has emerged which contradicts this assessment.

Comment: Page 28, Table 17 appears to be \$263,001 in error. Only the amount shown for Scientific Publications appears to be correct.

Response: This table has been revised.

### Washington State Department of Fisheries

Comment: The DEIS is comprehensive and otherwise commendable.

Response: Acknowledged.

Comment: The aquatic biota are well described. The Department of Fisheries would like to be advised of further studies and recommendations concerning aquatic biota, particularly in the enhancement or location of any areas suitable for sockeye "beach" spawning.

Response: Copies of the Aquatic Biota Studies have been forwarded to the Department of Fisheries.

Comment: The increased number of vehicles that would be parked at the Sand Point site could change water quality along the shoreline. Awareness of such potential pollution can possibly be inferred from the statement on page 41 that "the new NOAA facility would be required to have comprehensive effluent containment and disposal facilities, including appropriate surface water controls."

Response: METRO officials have concluded that on the basis of the water quality controls planned by NOAA, there would be no long term damage to Lake Washington water quality.

Comment: The Final EIS should correct the inconsistencies in Table 1 and 17. Lease costs for 1975 are listed as \$541,930 in Table 1 and \$804,930 in Table 17. In Table 17, items for space do not add up correctly and the number of personnel, amount of space and estimated rent value of the Northwest Fisheries Center are not listed.

Response: This section has been revised extensively and corrections incorporated.

### State of Washington Department of Game

Comment: The DEIS provides extensive discussion of the proposed project and associated environmental impacts. Information presented on biological conditions is well documented in part.

Response: Acknowledged.

Comment: Successful relocation of displaced wildlife is often not realized because

suitable alternate habitats are unavailable. This aspect of wildlife "displacement" should be explained in the following sections of the DEIS: Summary, Environmental Changes and Mitigating Measures for Potentially Adverse Impacts, (pp. 42 and 50) and Beneficial Impacts and Unavoidable Adverse Impacts, (p. 54). Wording in these sections should be changed to read, "displaced or eliminated" where displaced now appears. Response: Acknowledged: changes have

Response: Acknowledged; changes have been made.

### Puget Sound Air Pollution Control Agency

Comment: The mitigating measures for traffic flow can also be considered as measures which will tend to minimize automobile related carbon monoxide emissions since emissions have been shown to be speed related.

Response: Acknowledged.

### Puget Sound Governmental Conference

Comment: The DEIS is adequate in addressing environmental impacts that could reasonably be expected to occur as a result of the proposed development.

Response: Acknowledged.

#### **METRO**

Comment: The project is not likely to cause long-term adverse impacts to Lake Washington water quality, to METRO sewage facilities nor to public transportation services in the vicinity of the site.

Response: Acknowledged.

Comment: If proposed construction and dredging controls are applied, the impacts should be minimal and short-term.

Response: Acknowledged.

#### LOCAL AGENCIES

## King County Department of Budget and Program Planning

Comment: The Planning Division agrees with the comments of the Department of Public Works. The final statement would represent a more complete document if alternatives were considered in light of these issues. As the selection of Sand Point now seems, some of the alternatives for selection appear to be as equally or more beneficially impactive on the environment.

Response: Site alternative evaluations have been revised; see Part II.

Comment: The DEIS is well researched and documented and represents a good effort in fulfilling the requirements of NEPA.

Response: Acknowledged.

## King County Department of Public Works

Comment: Mitigating measures for dredging proposed on Page 49, B.1.c. do not include details of implementation, and no informa-

tion on water quality monitoring during and after construction is included. There is some question as to whether water and dredge material deposited on land for drying could be supported on the areas where there has been substantial previous filling.

Response: Environmental controls in connection with dredging will be accomplished by specifying them in dredging contracts. A monitoring program is planned. The concern about risks of depositing watery dredge material on filled land is acknowledged. It is true that there is a possibility that the fill may slide into the water. Engineering consultants have noted, however, that most of the material would probably be deposited behind the 200 foot shoreline reserve area which has been adopted by NOAA. Thus, most of the dredge material will be deposited behind old fill land.

Comment: The section dealing with alternative locations, Part II, pages 5-10, does not provide environmental impact information sufficient to enable a reader to evaluate possible effects of a NOAA facility built on a site other than Sand Point. The "No-Project Alternative" on page 7 seems to indicate that NOAA did not seriously pursue other alternatives.

Response: This section has been revised. Other alternatives were considered carefully prior to the submission of the application for the Sand Point property in 1972.

#### City of Seattle

Comment: The DEIS does not sufficiently address mitigation of traffic problems.

Response: Traffic studies have been extensively revised and mitigation measures have been included.

Comment: In Part III, the question of access to Sand Point and joint areas of responsibility should be discussed more fully in the Final EIS. It is not in the best interest of the traveling public to have too many entrances into Sand Point.

Response: See access discussion on page 16.

Comment: Under the Coastal Zone Management Act, permanent approval from the City would be required for actions in the shoreline area of Lake Washington.

Response: At present, specific approval of NOAA's plans at Sand Point does not follow from the Coastal Zone Management Act since Lake Washington is not included in the defined coastal zone. However, the act does require that all federal development comply substantially with local environmental regulations. The NOAA Center does comply substantially with the proposed City of Seattle Shoreline Master Plan.

Comment: NOAA and the City of Seattle should establish a formalized relationship in the development of the Sand Point Facility. Response: Such a relationship has been

established with the City of Seattle Park and Recreation Department.

### Jeanette Williams, Councilperson, Seattle City Council

Comment: The DEIS seems to be a complete, well prepared document that generally dispels concerns previously expressed relative to water and noise pollution, bridge openings and water route capacities.

Response: Acknowledged.

Comment: The NOAA-Park boundary should have visual appeal while not sacrificing minimum security requirements, or distorting joint topographical improvements.

Response: Specific arrangements for accomplishing this objective have been completed with the Seattle Park Department. Design reviews and coordination of development activities is assured, and the Community Liaison Committee will monitor the progress of these arrangements.

Comment: The projected 1100 parking spaces seem excessive. Transit access to the site should be improved as well as bicycle paths and designated bicycle parking areas. Response: Traffic and air quality studies have generated alternatives to the 1100 parking stall plan. Present plans include a parking space requirement for a minimum of 950 spaces; up to 1050 spaces may be created if design studies specify the higher amount.

Comment: Access points between sites must be built into designs for fencing, land-scaping, topographic changes and internal circulation routes. The points should encourage traffic movement in both park and NOAA facilities.

Response: See response above concerning NOAA-Park coordination.

Comment: Topographic changes should be continuous and unified in concept, and visually pleasing to users. Reestablishing features of the site that were lost when the aviation facility was constructed is suggested.

Response: See response above concerning NOAA-Park coordination.

Comment: The EIS should state the exact size of the average wake of NOAA's vessels. Response: Wakes from NOAA vessels during movements on Lake Washington and in the ship canal are minimal. See photograph on page 19.

Comment: A coordinating committee or task force made up of NOAA and city representatives should be established to ensure that compatible facilities are developed and standards are coordinated. Designated review points should be established as designs and plans progress.

Response: This committee has been established and is functioning. Several reviews are

expected during design phases of the NOAA Center. Activity will be monitored for compliance with commitments by the Liaison Committee.

Comment: The design of NOAA's buildings and piers, as well as the city park should establish appropriate people corridors, observation and view points necessary to facilitate public touring. Attractive signing, information stations and educational displays will help accomplish this.

Response: See response above concerning NOAA-Park coordination.

### City of Seattle Department of Community Development

Comment: The DEIS is one of the better EIS's reviewed, particularly in its discussion of visual impacts. The writing is clear and the tables and graphics are generally excellent, although several included do not seem to be relevant.

Response: Acknowledged.

Comment: The principal fault of the statement grows out of its "macro" viewpoint. The DEIS should place more emphasis on impacts felt by the site's nearest neighbor: the projected city park

Response: Since the publication of the DEIS, arrangements have been completed to coordinate the design and development of the NOAA Center with the park development.

Comment: The Final EIS should address itself to the NOAA proposal for treatment of the common boundary. A standard chain link, barbed wire fence would be most offensive to park users while other boundary demarcation methods with the same degree of security could add to the enjoyment of the area.

Response: See the boundary treatment concept proposed (Figure 12). The approach NOAA expects to utilize would minimize adverse visual effects.

Comment: A discussion of programming for the proposed visitor center and its relation to the park should be included in the Final EIS.

Response: Since the visitor center is one of the last facilities of the Center complex to be designed and built, plans have not been developed beyond the conceptual expressions in Part III.

Comment: The complex will generally strain fire protection capabilities of the city. The DEIS does not address itself to the special needs of marine fire protection, fire suppression, or reimbursement to the city for additional costs.

Response: Initial discussion with the Navy and the City of Seattle fire safety officials indicates that it is a viable strategy for NOAA to contract for fire protection services from the Navy, and City of Seattle

resources would provide a back up capability.

Comment: The statement does analyze the various approach routes to Sand Point under future labor force conditions; however, the results are not consistent with past city experience. Most of the Interstate 5 and Lake City Way traffic from the north would use NE 95th St., and this possibly would require the widening of Sand Point Way south of NE 95th., and the improvement of the intersection. The cost of such an improvement should not be borne by the City. Response: Traffic studies performed by NOAA consultants have not supported the prediction that Sand Point Way south of NE 95th to NSA would need to be widened. See Part IV.

Comment: The proposed entrance at the present "main gate" would be the most desirable point of access from Sand Point Way. Any significant increase in the use of the north gate as an entrance would cause significant traffic problems. The EIS should specifically identify the changes in city streets which will be required by the increase in traffic and how these modifications are to be financed.

Response: Traffic studies do not indicate a need to widen any streets. With modification of the north gate as suggested, no significant traffic problems are expected.

Comment: The EIS should consider access to the site from the park, both for daily traffic between the park and NOAA facility and for access to the visitor's center.

Response: Such access is a part of NOAA plans and commitments.

Comment: The EIS should consider the City of Seattle Law that city public works projects must set aside 1% of their capital budget for works of art to be installed in or with the project. Other agencies have been encouraged to meet this standard.

Response: NOAA officials have been considering allocating an amount for public art. If funds are forthcoming for the project, NOAA expects to make some funds available for this purpose.

Comment: The DEIS does not address itself to potential impact on Lake Union of the removal of the present NOAA base there. What future use might replace it, and whether it would maintain the "large ships" character of that corner of the lake is not clear. The alternative of retaining the Lake Union facility for short-term storage and ship work with one or two piers at Sand Point for outfitting ships with scientific gear developed at facilities there should be addressed in the EIS.

Response: NOAA has been unable to determine what activity might replace NOAA leased facilities on Lake Union. Since the Lake Union area is generally high demand real estate for both houseboat and commer-

cial purposes, it is not likely that successor tenancy will pose an economic problem. The alternative of utilizing some pier space at Lake Union or other sites for purposes of safety from adverse weather or for convenience to repair facilities has been studied. There is some operational merit to this strategy and NOAA intends to moor vessels at such moorages as the need arises. The basic need for vessel berthing facilities at Sand Point would not be affected, however.

Comment: The treatment of mitigating measures in the DEIS is weak. The document should attempt to respond to each potential adverse impact and propose a solution which should be a commitment to implement or fund.

Response: This section has been reviewed and revised to reflect recent studies and plans.

### Seattle-King County Economic Development Council

Comment: The consolidation of NOAA activities at a site in Seattle allows for future planned expansion in an orderly, unobstrusive and cost effective manner.

Response: Acknowledged.

Comment: The loss of NOAA to a regional headquarters outside of Seattle would be felt economically.

Response: Acknowledged.

Comment: The NOAA project will provide the community with considerable scientific stimulus, support for management, conservation and improvement of resources, public participation in decisions, opportunities for involvement with local learning and research institutions and the creation of a stimulating urban experience on Lake Washington allowing visual and site access to interested citizens.

Response: Acknowledged.

## City of Seattle Parks and Recreation Department

Comment: Several specific points of potential conflict between the NOAA Center and the park should be addressed in the EIS. Has NOAA considered the problem of noise and visibility of team sports and games located close to the boundary with the park? What measures such as alternate site development concepts would reduce these and other problems associated with active play? Conversely, will noise from ship maintenance and support activities be disturbing to passive users of the park such as picknickers. sunbathers, etc. More generally, will the ship activities interfere with activities of those who have sought out the nature-like areas of the park as a retreat from the city?

Response: NOAA does not expect noise from the park activities to handicap the functioning of the NOAA Center. Most park activities are likely to occur in late afternoon, evening or weekend hours when

NOAA activities would be at lowest levels. Similarly, what noise is generated by NOAA activities will be both distant from park activities as well as occurring at times when park activity is at lowest levels.

Comment: A cooperative effort between the Department of Parks and Recreation and NOAA will probably be necessary for locating various activities of the two facilities to insure compatible development.

Response: Cooperation arrangements have been completed which will assure compatibility of facilities, signing and so forth.

Comment: What is NOAA's concept of a suitable boundary between the two facilities?

Response: See Figure 12.

Comment: Will security for the NOAA Center require that public access be restricted to a few guarded entry points? How will this be accomplished? If there are security measures such as a night patrol, how will they be armed? The Final EIS should discuss authority and jurisdiction in regards to security so that Park security measures will complement those of NOAA.

Response: Public access is expected to be restricted to a few convenient gates. It is expected that during daylight hours, relatively free access to the NOAA site would be available. During nighttime hours access would be restricted. Mobile patrols are planned for security purposes, patrol persons would be armed at the same level as the Navy security patrol. Somewhat formal arrangements have been made with Seattle Parks officials to develop compatible security plans.

Comment: There will not be any major traffic problems due to the combination of uses at the site. Park generated traffic will be heaviest on weekends and summer evenings when NOAA traffic is lightest. The EIS should note this, adding whatever information on park-generated traffic volumes is necessary to document the point. The Park Department will be glad to furnish the required data.

Response: Revised traffic studies reflect the park-related traffic.

Comment: The Final EIS should establish how NOAA proposes to fulfill their commitments during the development of the Center and the park.

Response: Plans and commitments expressed in an EIS are binding in the sense that they are enforceable by the courts. In addition, the Citizen Liaison Committee acts as a monitor of commitments, as do the various city departments concerned with the NOAA Center development. Fulfillment of the various commitments will be continuous and incremental over the period of the design and construction of the NOAA Center. NOAA is committed to reviewing all plans and major actions with these concern-

ed parties to ensure fulfillment of commitments made.

#### City of Seattle Board of Park Commissioners

Comment: The Board of Commissioners firmly supports a coordinated planning approach by NOAA which will impose the least adverse impact on the park facility and surrounding residential community.

Response: The position taken is acknowledged; this position is taken as a substantial endorsement of the content and approach of NOAA's plans and commitments.

Comment: A cooperative planning approach by NOAA with the park designer for joint development and joint use will result in educational and recreational experiences for Seattle which will be of national significance.

Response: Acknowledged.

Comment: The NOAA installation should reflect a blending into and extension of park facilities.

Response: This guiding principle is a part of the set of design guidelines developed in the EIS process.

### VOLUNTEER GROUPS AND INDIVIDUALS

#### View Ridge Community Club

Comment: It would be very unwise to have any access into Sand Point from other than Sand Point Way N.E. Whether or not NOAA is relegated to using the south end entrance, the View Ridge Community hopes that NOAA would intercede to keep the park's access at 65th St. This should be addressed in the Final EIS.

Response: Traffic plans for the NOAA Center have recognized a city park entrance at the south end of the Naval Support Activity, coming off Sand Point Way.

#### Hawthorne Hills Community Club

Comment: On page 50-51, the nine guidelines mentioned relating to overall facility design appear to offer reassurance that the completed facility and the activity therein will not be disturbing or obnoxious to residents of Hawthorne Hills.

Response: Acknowledged.

Comment: Some residents consider chainlink fence a visual blight too strongly suggesting commercial and industrial activities, and hope that it can be avoided, minimized or camouflaged.

Response: It is agreed that chain link fence is unattractive. In the process of designing landscaping for the NOAA Center, NOAA hopes to be able to establish a way to obscure the chain link fencing required by NSA officials.

Comment: Part IV, A, 1, Sonic Quality. The Final EIS should assure that construction noise above ambient noise levels will general-



**NOAA Ship Cobb** 

ly be restricted to 7 or 8 daylight hours on weekdays and include a commitment regarding noise level control of pierside and staging area equipment.

Response: Standard noise restriction requirements in government contracts (see Exhibit Q) would substantially mitigate noise impacts in the adjacent residential areas at any time. Moreover it is not in the government's interest, in typical situations, to allow construction work beyond normal working hours because premium pay for workers would be required which could sharply escalate project costs. In preliminary construction scheduling, NOAA has not planned high noise level activities such as pile driving and demolitions beyond normal working hours.

Comment: There is an increased accident potential in the treacherous segment constituted by NE Princeton Way, Figures 22 and 28.

Response: The comment is acknowledged. During peak hours, traffic on N.E. Princeton Way would be heavier due to the NOAA Center activity. This condition would tend to discourage through traffic there during peak hours.

#### The Windermere Corporation

Comment: The residents and members of Windermere strongly oppose vehicular access to the Sand Point Park from N.E. Windermere Road or 65th Ave. N.E. The Board of Trustees is authorized and directed to employ counsel and to seek appropriate relief in courts or otherwise to preserve the residential character and quality of Windermere. We urge that access to Sand Point Park be

through the existing N.E. 65th St. and Sand Point Way N.E.

Response: This issue is of more concern to City park planners than to NOAA: however. NOAA intends to have sightseeing visitors enter the NOAA area through the city park. An access point directly off Sand Point Way would be the most appropriate functional approach to achieve this objective.

#### League of Women Voters of Seattle

Comment: Procedures should be developed to deal with complaints from nearby residents over noise levels that cannot be reasonably controlled through choice of equipment, use and location of work. Construction contracts should call for the most up-to-date equipment and procedures so that noise will not cause annoyance to residential areas.

Response: In discussions with community club members adjacent to Sand Point, NOAA has assured them that NOAA officials will respond immediately to noise complaints, should they occur. Noise studies for the EIS indicate there is little likelihood of NOAA activities creating noise above ambient levels. As a matter of policy, government construction contracts include noise restriction requirements (see Exhibit O).

Comment: The need for whistles for crafts should be critically evaluated to assure that they are necessary and will not be aversive to residents.

Response: Vessel whistles are primarily safety devices and are used sparingly. At Lake Union where NOAA vessels have been berthed for over a decade, nearby residents have not complained of whistle noise from NOAA vessels.

Comment: The paragraph titled "Long Term Changes in Sonic Conditions" is confusing. It states that NOAA activities will tend to maintain present ambient levels rather than helping to reduce them. Is the reference to past uses as an airport rather than present status?

Response: The reference is to 1974-1975 conditions which do not include aviation activities.

Comment: The provision for 1100 parking spaces seems excessive in light of the number of on-site employees projected in 1980 plus maximum number of in-port ship based employees and visitor use.

Response: The parking space planning number used in the DEIS is a high number. More recent plans indicate that as few as 950 parking places could be appropriate. The matter will be resolved during design studies to come.

Comment: The Final EIS should include more specific information on how tour and educational facilities are to be used and whether there are any problems in connection with security provisions.

Response: NOAA recognizes possible security problems in connection with visitor facilities planned for the Center. Detailed plans will be worked out with Center designers and reviewed with the Citizen Liaison Committee and City officials. This process will help develop ways to minimize security risks while yielding high quality visitor accommodations.

Comment: The League of Women Voters finds the low-profile parklike setting detailed in the DEIS acceptable.

Response: Acknowledged.

#### Aircraft Owners and Pilots Association

Comment: The AOPA supports the position of the State Office of Program Planning and Fiscal Management and agrees that if the Sand Point facility is not retained, in part, as a general airport, then another site will be required in the near future at enormous costs.

Response: Acknowledged.

#### Sand Point Air Park Association

Comment: In page 5, Table 1, the total of all property leased by NOAA is \$541,930. The same components on Page 28 show a \$262,460 error.

Response: The figures noted have been revised.

Comment: The figures in Table 17, page 28, column 4 do not add up to the totals on page 5.

Response: The figures have been revised.

Comment: What is the correct figure for personnel in fiscal year 1975?

Response: In the Seattle area the total NOAA personnel count as of July 1975 is 1.160

Comment: Why is more than four times the space required for only 1¼ times the staff in 1980? Why is 142.4 square feet per man in 1975 growing to 416.6 square feet per man in 1980, 419.8 in 1991 and 420.4 in the year 2000?

Response: Present space is inadequate in many cases and insufficient in others. New, appropriate space for NOAA functions at present and in the future require the additional amounts. Space and personnel estimates have been revised; see Table 16.

Comment: Why is the cost per square foot expected to stay constant from 1975 to the year 2000 as shown in Table 18 in the DEIS?

Response: This figure was used to assure a conservative estimate. Adding inflation factors and other cost escalations would have produced a more attractive result.

Comment: When the DEIS was issued, most construction indices indicated a cost escalation of at least 20% for 1974, and 11% for 1973, and the most conservative projections for cost escalation for 1975 are 10%. Why weren't construction estimates in Table 20 escalated at these rates? Why wasn't the 50% increase in costs since 1972 reflected in the current prices shown for construction costs in Table 20?

Response: NOAA has used an inflation factor of 1% per month compounded in current cost estimates for the NOAA Center development. Consultants advise that this rate is accurate for the type of construction NOAA proposes.

Comment: Why was such a low discount rate (cost of capital) used in Table 20?

Response: Corps of Engineers standards were used since this rate has gained acceptance in relative value analyses.

Comment: Why was a 60 year lease term used to compare leasing proposed NOAA facilities with buying (constructing) new facilities. Is it because the long lease term penalizes leasing severly?

Response: The sixty year term was used because this period is the typical time period used in government value analyses.

Comment: Page 7, column 3, No-Project Alternative states that if Sand Point were unavailable, the project would be abandoned altogether and NOAA would remain at its present facilities. Does this mean that the three other Seattle sites have no merit, the NOAA claims are unrealistic, or the need isn't there?

Response: If the Sand Point site were not available for the NOAA Center, other sites are not sufficiently beneficial for consolidating NOAA facilities to make them more attractive than continued leasing of facilities around the city.

Comment: Page 49, B, 1, c., Mitigating Measures are vague as to how they will be implemented.

Response: Implementation of the measures proposed would be through specifications to a dredging contractor. Acceptance and payment for the contractors' work would depend upon compliance with the conditions identified in the EIS as expressed in the bid documents. These activities will be monitored by the Corps of Engineers and the Citizen Liaison Committee.

Comment: No information on water quality monitoring during construction and post-construction phases is included.

Response: NOAA plans to monitor water quality and aquatic conditions during and after construction.

Comment: Pages 5-10, Part II do not provide information as to air quality and water quality so the reader can make an evaluation. The most convincing argument in favor of the selected site appears to be "City favors NOAA use of the site..."

Response: Additional information has been provided in Part II.

Comment: Page 6, Table 2, Item 13, the Magnuson amendment prohibiting GSA from implementing the preferred disposal decision should not be considered a "congressional legislative mandate."

Response: Legislation pertaining to the disposal of the Sand Point property falls within the usual meaning of the word mandate.

Comment: Page 31, 6, Land Use Conditions overlooks the fact that an airport in use for over fifty years and vital to the economy and security of the city is being destroyed. Response: The land use concern of this impact statement has been an environmentally sound use of an inactive military airport in a lake and residential setting. The contention that the airport is "vital to the economy and security of this city" has not been established nor in any way sustained through any EIS process.

Comment: Page 32, 6, a., Land Use Change Trends. The DEIS does not consider the fact that during 1940 residents chose to build their homes beside the Naval Air Station. Where is there a case where new residences were built overlooking piers for ocean going ships?

Response: Perhaps the comment was intended to suggest that since homes were built beside the Naval Air Station, there exists something of an endorsement of aviation use of Sand Point rather than NOAA use. In 1973 a majority of View Ridge area residents endorsed park and NOAA use of the site.

*Comment:* The Final EIS should include photographs of the NOAA fleet.

Response: Photographs of NOAA vessels have been included.

Comment: Page 32, 6, d., Relevant Land Use Policies. The complete removal of a runway might not fall within the Coastal Zone Management Act of 1972.

Response: The comment does not appear to apply to this statement.

Comment: Recently a \$3 million damage claim was awarded to the Roanoke Reef Apartment Developers who were stopped from putting residences in industrial Lake Union. By this logic, how can NOAA justify placing industry in recreational Lake Washington where ships will have to pass through sailboat races, canoers, water skiers and swimmers?

Response: Aside from the questionable logic of the comment, NOAA vessel use of Lake Washington would be quite infrequent, no more than 150 trips per year. Moreover, the majority of the trips would occur in winter when recreation use is lowest. Vessel movement conflicts with recreational activities are not expected to be a problem in these circumstances.

Comment: The Washington State Department of Ecology questions the propriety of NOAA's use of Lake Washington for industrial type activity. NOAA has a less than satisfactory record of cooperation with this agency respecting its operation on Lake Union. (GSA Final EIS, Page 53).

Response: The GSA comment was misinformed in the statement noted. NOAA's cooperation with state agencies, including the Department of Ecology, has been in accordance with all laws and interagency agreements.

Comment: There is plenty of room for expansion in industrialized Lake Union which needs upgrading of present deteriorating commercial properties. The rent in Lake Union would provide a tax base for the benefit of all Seattle.

Response: While the comment may be generally true, a NOAA Center at Lake Union would be contrary to the City of Seattle long range development plans for Lake Union. Also important is the fact that the character of Lake Union industrial and commercial activity is not suitable for a research center.

Comment: NOAA has produced many conflicting reports on the subject of creating new jobs for the Seattle area. A document dated 7/22/74 shows an increase of personnel numbering 170 (from 746 to 916) in 1980.

Response: Note the current estimates of personnel in Part II.

Comment: Part III, Section B, 4, is so inaccurate in reason, data and arithmetic that Real Estate and Investment Specialists attempting to reconstruct the intended NOAA logic behind the inaccurate totals had to entirely rebuild the charts and estimate.

Data from readily available, commonly used financial history and projections was applied resulting in gross errors of conclusion by NOAA researchers.

Response: This section has been revised to correct some arithmatic errors and to reflect more recent and more specific information.

Comment: Why weren't the costs of operating and maintaining the proposed facilities added to the cost of construction. Doesn't the cost of leasing include the costs of operation and maintenance of facilities?

Response: Maintenance and operation costs are added to current estimates. Some leases do include maintenance and operation costs.

Comment: Why weren't actual lease bids obtained to compare with the construction estimates used in Table 20?

Response: Typical government lease rates were considered to be an accurate reference point.

Comment: Purchase, sale and leaseback of the proposed facilities should be considered in the FEIS.

Response: Purchase, sale and leaseback arrangements are used in some cases when public lands are unavailable for facility construction. When specialized research facilities are required and there is public land available and suitable, government ownership is more attractive economically.

*Comment:* Aviation use of the airport is incompatible with the RS 7200 zoning (page 86). Why is this commercial project an exception?

Response: Government and educational uses are permitted in RS 7200 zones. The Sand Point site has been identified in several city plans as appropriate for facilities such as the NOAA Center.

Comment: Residences along Lake Washington are extremely limited in dock size allowed, yet NOAA proposes to install 330 ft. and 470 ft. pier with attendant dockside activity.

Response: These statements are correct. It should be noted that the proposed City of Seattle Shoreline Master Plan does not prohibit research and educational facilities such as the NOAA Center in the zone proposed for Sand Point.

Comment: Noise from light aircraft is no more offensive than that measured from NOAA ship and construction at the same distance (Table 24, page 43 and Exhibit R, page 84).

Response: No data nor environmental impact statements on possible airport use of the Sand Point site have been presented which would sustain the conclusion presented.

Comment: Page 5, column 1, NOAA's decision to take over Sand Point was made in 1970 not 1971.

Response: The 1971 date is correct. How-

ever, NOAA officials investigated the possibility of a new NOAA Center at Sand Point and at other locations prior to 1971.

Comment: Although NOAA took out an application to hook their raw sewage into METRO, their sewage was being dropped into the lake for years following. When did NOAA hook up its Lake Union vessels to METRO?

Response: At the Lake Union facility, NOAA has had vessels sewerage connected to METRO for a decade.

Comment: One might question the Albrecht study (page 5, Part II) as being politically motivated since alternative sites are a requirement of an EIS after \$400,000 had been spent by NOAA in this effort over four years.

Response: At issue in examinations of site alternatives is the matter of impacts of a NOAA Center at a particular site. The studies used in this document express and confirm assessments of site alternatives which took place over a period of several years.

Comment: Item 7 (page 5, column 2) is highly questionable—the reduction of lease and rent expenditures. Annual maintenance of \$1.9 million in buildings (page 9) could approximate \$2 million—a total of \$5½ million annually or ten times more than current rent.

Response: This section has been revised and expanded, yet savings in this category remain a substantive basis for collocating NOAA facilities.

Comment: How can the project used by 250,000 people annually in 1980, were the airport utilized, not be considered a valuable "public use."

Response: The comment seems to suggest that an airport at Sand Point might be a valuable public use. Environmental soundness and public preferences and priorities aside, an airport at Sand Point could be considered a valuable public use.

#### Haller Lake Improvement Club

Comment: The Haller Lake Improvement Club rejects the proposed NOAA development as incompatible with land use and environmental goals and objectives for the Lake Washington area. There are other locations more appropriate for the NOAA facility.

Response: Neither contention was borne out by EIS studies or DEIS responses.

Comment: The earth fill to bring the back up land to the elevation of the piers and to provide a base for the piles would produce a permanent unacceptable view barrier for low surrounding areas.

Response: The proposed fill to pier height would not exceed six feet above the present waterline. With pier area landscaping and

landscaping in the area behind the piers, the raised pier area would be barely distinguishable from the dozen or so residences with a horizontal view of the NOAA site.

Comment: Proposed dredging to obtain fill would produce irreparable short and long term consequences.

Response: The dredging proposed is to provide a moorage area. The impact of the dredging is not of significant consequence in terms of the biological productivity of Lake Washington.

Comment: Many years of effort have gone into the reduction of commercial and industrial orientation of the entire Lake Washington Basin. The NOAA development will be equivalent to a \$30 million "industry" and incompatible with the area.

Response: The NOAA Center development is far from being incompatible with the Sand Point area. The compatibility and desirability of the NOAA Center at Sand Point is acknowledged and supported by surrounding community clubs, local government officials, and city park officials. While there has been some dissent from this support, the dissent has not grown nor has there been a successful challenge to the facts supporting the compatibility of a NOAA Center with the Sand Point setting.

Comment: The cost of development of some \$27 to \$37 million for this facility is not in the best interest of public safety and the area's taxpayers; especially in light of President Ford's proposal for tax reductions to help the economy.

Response: Funds for the development of the NOAA Center are being sought through the normal executive budget process, and are justified on the soundness and public benefit of the proposed expenditures.

#### **Audubon Society**

Comment: The decision to allow NOAA to move into Sand Point and tear up runways will displace the unique pheasant population that is presently at the base.

Response: The comment is acknowledged to the extent that pheasants would be displaced by any activity which removes natural habitat elements and alters secure circumstances of the pheasant. The change to a NOAA Center (and to a city park) is probably of substantially more overall public value than the small pheasant flock.

#### Laurelhurst Beach Club

Comment: The DEIS fails to mention the existence of the Laurelhurst Beach Club and how proposed moorage and traffic of ocean vessels will conflict with established use of the Beach Club.

Response: Moorage and traffic of NOAA vessels will have no significant adverse effect on the Laurelhurst Beach Club. Construction and operation of the vessel moorage will be more than a mile away from the club.

NOAA vessels will pass the club about 1,000 yards offshore. While NOAA vessels will be visible, no other effects would result.

Comment: The DEIS statement "beneficial visual relationships with other elements of the environs" can only be accepted if the proposed site modifications are considered by themselves and the vessel moorage and traffic ignored.

Response: Consultations with a sampling of residents who can see the pier area and moving vessels indicate favorable attitudes toward the visual presence of NOAA vessels. See page 50.

Comment: NOAA's criteria for vessel use place Sand Point a poor fifth among five choices. In contrast, Manchester, Piers 90 and 91, and present facilities at Lake Union appear to be ideal. NOAA vessel use of Lake Union is much more in character with existing usages of that body.

Response: On the basis of vessel accessibility alone, Sand Point does not rate as high as other sites. However, this factor is most easily compensated for since NOAA vessel transits of the ship canal are relatively infrequent. As the effectiveness chart indicates, other considerations establish that the Sand Point site has an overall value considerably higher than other sites. The NOAA Center is not simply a vessel base; therefore, the siting of the Center must be in terms of the dominant character of the Center which is the research and scientific service functions of NOAA components. The character and atmosphere of Lake Union do not enhance the essential mission of NOAA components. The effectiveness ratings express this fact.

#### Lake City Chamber of Commerce

Comment: The Lake City Chamber of Commerce Board of Directors opposes the proposed NOAA development for the Sand Point location. The intrusion of this seaport facility on Lake Washington is environmentally undesirable.

Response: The position of the Chamber is acknowledged.

#### Montlake Community Club

Comment: Why was the Fort Worden site rejected because of distance and the certainty of substantial development there by the State Park and Recreation Commission?

Response: Both the distance from Seattle and the certainty of recreational development make the site unattractive. In addition, the rural setting would be adversely affected if the NOAA Center were to be introduced.

Comment: An eight minute bridge opening for a NOAA vessel would cause traffic tie-ups of greater magnitude than those for a pleasure craft. The DEIS should specify what traffic problems will occur with eight minute bridge openings 150 times per year.

Response: Bridge openings as a result of NOAA vessel movement would be less than 10% of the total number of openings in a year. In addition, NOAA vessels move at off peak hours which further minimizes traffic disruption. The effect of any bridge opening is the same regardless of the time involved; traffic is halted for the duration of the event. A typical elapsed time for an opening for a NOAA vessel, with an experienced bridge operator is five minutes.

Comment: An 1100 space parking lot for 916 employees is inexcusable in an area with good bus service. The excessiveness of the parking lot gives the impression that more NOAA expansion is contemplated. What expansion is planned beyond 1980 and at what point will NOAA establish a no-growth policy?

Response: Parking is calculated for both NOAA employees and visitors. The 1100 calculation was exaggerated because NOAA was unable to determine with precision the effect of new programs being legislated at the time of preparation of the DEIS. Based on new and more accurate employee level estimates, a minimum of 950 spaces would be required; as many as 1050 spaces may be developed if design studies specify the higher number. Since it is the mission of NOAA to respond to a range of national environmental research and scientific service needs, growth limitation policies are not a prerogative of NOAA officials, but of the Congress which assigns NOAA's mission. Nevertheless, any growth that might be planned for the Sand Point site, beyond that which is now contemplated, would be subject to Impact Statement requirements.

Comment: What connections are there between NOAA and the Bureau of Fisheries adjacent to Montlake? Will there be any change in the physical use of the fisheries including boat traffic?

Response: The Montlake facility, the Northwest Fisheries Center, is owned by NOAA and is part of the National Marine Fisheries Service, which is a major component of NOAA. No change in the present use or function of the Center is contemplated or expected.

Comment: Can NOAA ships go through the Canal at night and what are the potential problems this might cause?

Response: The Ship Canal is not lighted at night at levels sufficient to permit safe use by NOAA vessels. NOAA has no present need to use the Canal after dark.

Comment: The EIS should not take credit for the beneficial impact of the park, since NOAA does not guarantee the funding and development.

Response: NOAA (as with any other public agency) cannot guarantee the funding of the planned NOAA Center. However, if the Center is funded as expected, it would be

beneficial to the park, as has been described in the Statement.

Comment: Stage-by-stage guidelines, coordinated with the Department of Ecology, of plans, construction and use of the NOAA site should be incorporated in the Final EIS. Response: The State Department of Ecology generally recognizes the City of Seattle as having the prime role in overseeing the environmental merit of development within the city. NOAA has developed review and coordination mechanisms with the City of Seattle and community groups in the vicinity of Sand Point. See Part III.

Comment: The Final EIS should show the visual impact described in the Draft, including aerial photographs of east and west shorelines and boats at current pier moorage. The proposed piers and views from various points should be simulated.

Response: Such detailed visual models would require specific architectural designs as a base. The National Environmental Policy Act requires that impact assessments be made well ahead of design stages. However, review and coordination with City officials and with the Community Liaison Committee should assure acceptable NOAA Center designs.

Comment: The Final EIS should guarantee cooperation with the City of Seattle in recognizing the Burke-Gilman Trail's potential as a viable transportation unit and assure that it will not be disrupted during peak hour traffic.

Response: NOAA is committed to cooperating with the City in achieving, as much as possible, the goal of developing the Burke-Gilman Trail. It has not been established that it is an objective for the Burke-Gilman Trail to be free of disruption during peak hour traffic periods.

#### Friends of Sand Point Park

Comment: The Final EIS should stress compatible construction, design, landscape and boundaries between NOAA, the Park and the surrounding community.

Response: Part III identifies commitments and processes for achieving compatibility with nearby development.

Comment: A communication and review board should be created to continually inform people when decisions or changes are going to be made concerning the Sand Point facility.

Response: The Citizen Liaison Committee has been established and NOAA representatives are present at each meeting to provide status reports of NOAA activities.

Comment: Friends of Sand Point Park support and are going to have access to the park from the southern gate that is now on 65th St. We hope NOAA will structure its own traffic to complement this.

Response: Traffic management plans for NOAA traffic have been developed in consultation with city park and Navy officials. NOAA traffic plans complement expected traffic to the park.

Comment: The Final EIS should stress economical measures so that the city, county, state, NOAA and the Friends of Sand Point Park can cooperate to save money and still maintain the quality that is necessary. If possible, sharing facilities is suggested.

Response: Extensive cooperative facility uses have been discussed with City park planners. See page 18.

#### **Belvedere Terrace Community Council**

Comment: The Belvedere Terrace Community is concerned that an already dangerous traffic problem may be heightened if NOAA is successful in encouraging more use of Sand Point Way by its employees. The EIS should make further study of traffic volume impact on Sand Point Way and the resulting problems of access to the main thoroughfare from communities tied directly to it.

Response: Considerable additional study of traffic circumstances was completed and is utilized in the transportation section of this document.

Comment: The possibility of mutual use of the current main gate with the Navy should be stressed. Furthermore, access plans should be developed which would bar heavy vehicular traffic using the South gate.

Response: Arrangements have been completed for joint use of the main gate with the Navy.

Comment: The description of "residential street lamps" on page 15 needs further clarification. If high intensity lamps are used, the lighting should be shielded in such a way as to prevent turning the NOAA pier area into an almost daylight situation during night hours.

Response: General lighting for the NOAA Center, including the pier area, need not be of greater intensity than residential street lights. Emergency lighting in the pier area would be higher intensity, downward directed spot lights. Use of such emergency lights would not affect residential areas at night.

#### **Aviation Heights Community Club**

Comment: We question why the entire NOAA base could not be located on the recently acquired and still undeveloped urban renewal track extending upland from Portage Bay. A second alternative would be to separate vessel and docking operations from other administrative and research operations. The vessel base could be located closer to the University, Puget Sound, and the locks with the non-marine operations at Sand Point.

Response: In general, NOAA has favored a location close to the University of Washington and to Puget Sound. University of

Washington urban renewal lands would satisfy this desire, but displacement of University plans for utilizing this tract would disperse University activities. Therefore, University officials strongly objected to NOAA consideration of this alternative. As noted in Part II, the Sand Point site provides acceptable access to the University of Washington while avoiding adverse effects on the University and the surrounding residential and commercial areas. Consideration of separation of the vessel operations from the Sand Point site is discussed in Part II.B.

Comment: The construction of a north entrance would be in conflict with the normal and safe activities of this neighborhood and its use of the View Ridge Swimming and Tennis Club. This neighborhood opposes the potential entrance near the North Gate at Sand Point.

Response: NOAA plans to utilize the Naval Support Activity main gate and the north gate. The north gate will be used primarily as a service entrance. Traffic studies indicate that there will not be significant adverse impacts on the Aviation Heights community as a result of this access plan.

Comment: The community expects that it should not have to seriously alter its continued recreational use of the entire Lake Basin and that NOAA will fit its activities into these uses.

Response: NOAA activities on Lake Washington will not conflict in any substantial way with recreational use of the lake or its tributaries.

Comment: Any major deviation from the communities low ambient sound level would be brought to the attention of the responsible officials.

Response: There is not likely to be any change in the ambient noise levels in the Aviation Heights Community as a result of the NOAA Center development.

Comment: Citizen concern about the intrusion of large vessels into Lake Washington would be alleviated if NOAA would separate vessel and docking operations from other administrative and research operations.

Response: NOAA acknowledges citizen concern about NOAA vessels using Lake Washington. The specific adverse impacts of this use are not in any way extreme, according to EIS studies on which this statement is based. Moreover, there are a number of significant benefits. Also of great concern is the continued NOAA operational disfunction that occurs if vessel-related facilities are continued separate from laboratory and support functions.

Comment: The Aviation Heights Community thinks there should be a formal and informal review process and would like to participate in both. A review board should be formed that can be consulted and advised at regular intervals.

Response: A formal citizen review committee has been established and is in operation, and includes an Aviation Heights representative. NOAA activity status reports are presented at each of the meetings. In addition, NOAA officials meet regularly with City Parks officials to review plans.

#### Virginia Burnside

Comment: The DEIS is laden with unsubstantiated value judgements which should render it inadequate as an environmental assessment.

Response: The DEIS does include a number of value judgments. These assessments and judgments are sustained by studies and by comments received during the DEIS review process.

Comment: What recreation advantages would a large seaport pose in contrast to those offered by a park?

Response: The NOAA vessel berthing area is in no way a large seaport. Vessel activities are undoubtedly attractive to visitors. Similarly, most of the planned functions on the NOAA site, from aquaculture facilities to weather science facilities, are unique and of interest to visitors. As an adjunct to a large park, the NOAA facilities are an unusual complement. The NOAA Center as a nearby recreational and educational resource probably increases the value of the park.

Comment: Lengthy deepwater piers and elevated revetments above existing shoreline are the worst kind of visual pollution and do not enhance the attractiveness of the Sand Point neighborhood.

Response: NOAA piers are classified as shallow water piers. The staging area is not expected to be more than five or six feet above the existing waterline. Trees and plant materials used extensively on the site and in the pier area would decrease the sharp contrast of the paved pier area with the remainder of the site. This development is considerably short of the "worst kind of visual pollution" as suggested. On the contrary, community reviews, public hearings, and DEIS comments document that NOAA's plans are at least acceptable from the standpoint of visual appeal.

Comment: The Manchester site is superior to the Sand Point site in all but cost, and the fact that NOAA personnel would be required to move to Manchester and Bremerton. This should be examined again in the Final EIS.

Response: As noted in Part II, likely adverse impacts of a NOAA Center at Manchester are extensive and high. Both from a cost and environmental standpoint, the Manchester site would be an undesirable site for the NOAA Center.

Comment: The Final EIS should contain an analysis of what the environmental loss would be of this recreational land to the

future population of the city. The loss is irreversible and incalculable.

Response: NOAA use of a portion of Sand Point would amount to a loss of potential park land. Yet the NOAA Center will be a recreational and educational resource. Moreover, NOAA use of the land is not irreversible; the land would be available for a city park if NOAA were to move its activities to another site. While it is acknowledged that the merit of a city park verses a NOAA facility on the NOAA site is difficult to calculate, there is not a basis for presuming that the proposed NOAA Center is without merit. The substantial support of the City of Seattle for the NOAA Center at Sand Point is based on the merit of the NOAA Center as an important recreational, educational and economic resource, over a park use.

Comment: Residents of the area have been penalized by inadequate public recreational resources in comparison to other parts of Seattle and oppose the use of prime recreational land to create a large seaport of Sand Point.

Response: Public meetings and DEIS comments have indicated considerable support for the NOAA Center at Sand Point. There is no reliable information to the contrary.

#### Scott L. Smith CDR, USN (Ret)

Comment: Since all pier space would be used only during a few weeks each year, it seems wasteful to plan for peak berthing of NOAA's twelve ships. Less pier space could adequately serve and reduce visual impact. Three possible alternatives are: three piers with berthing along the revetment between the piers; two piers with nesting of vessels or the use of anchorages or rented moorage during peak periods; quay wall moorage with mediterranean style mooring during peak berthing periods.

Response: The size and configuration of the berthing area was set to meet requirements during a variety of circumstances. Thus, such factors as wind direction, critical operations times, vessel outfitting and repair and the berthing of inactive vessels were instrumental in setting the pier configuration. Lesser amounts of pier space and unconventional berthing patterns would probably require construction of more piers in future years. In short, the suggested construction alternatives have proven to be impractical and inefficient, given the kinds of activities in which NOAA vessels are involved. Apart from this operational concern, given the relatively low level of actual adverse impact of pier construction and use, significantly less pier space would not yield significantly more environmental merit.

Comment: What new activities will require 300% more floor space and how much of this additional floor space is presently available in Hangar 32 and 33?

Response: NOAA activities and space needs

are discussed in Part III. The Hangars are expected to be used for storage, shops and enclosed work spaces.

Comment: The Final EIS should specify exactly what each facility would look like under varying degrees of financing.

Response: NOAA views design guidelines and other environmental quality commitments as binding regardless of partial funding circumstances. Thus, smaller or fewer facilities would have to meet the same environmental criteria as the structures planned.

Comment: Page 54, Beneficial Impacts. There appears to be no benefit in piping water runoff into storm drains and little difference if the water percolates through the ground into the lake or runs off the payement.

Response: Runoff from paved areas is required to be channeled into the sewage disposal system since such water frequently carries oils and debris. Runoff from grassy areas can safely percolate through the soil to the lake so long as no erosion occurs.

Comment: It is debatable as to the degree of improvement in education, recreation or City pride over what exists with NOAA's present facilities?

Response: NOAA's present facilities are dispersed around the City and in most cases are overcrowded and inadequate for the purposes for which they must be used. Thus, consolidated, appropriate facilities which are easily accessible from a park undoubtedly result in an increase in educational and recreational resources.

Comment: Under Economic Conditions, to say that Sand Point would be a "catalyst for growth of science-based private business in Seattle" is to say that NOAA's present facilities have not been adequate.

Response: NOAA's present facilities have not been adequate. This, of course, is the essence of the case for new and consolidated facilities.

Comment: How will NOAA encourage mass transportation? A study should be included in the DEIS to show potential users of the 8/41 bus.

Response: NOAA representatives have consulted with METRO transit officials on this issue. Improved bus service to the Sand Point area could be a consequence of the development of the NOAA Center. This additional service would be beneficial to park users, residents of the area, as well as to NOAA employees.

Comment: NOAA should indicate which of their "interesting facilities" will be open to the public on weekends. Even the interesting ones may have difficulty competing with park facilities.

Response: Plans are not firm regarding weekend services to the public. It is not the

intention of NOAA public service facilities to compete with park resources. The presence of the NOAA Center and facilities to accommodate visitors offer to the public unusual recreational and educational choices that could not be available otherwise.

Comment: The DEIS fails to state what will happen to buildings presently leased by NOAA.

Response: Upon NOAA vacation, property leased through GSA will be made available to other government users. Other space leased directly by NOAA, all on a short-term basis, would be available for new tenants.

Comment: It is likely that new employees in the area will find housing in the Sand Point vicinity overpriced.

Response: The suggestion is noted.

Comment: The Final EIS should state NOAA's intentions regarding parking vehicles of unmarried ship's crewmen.

Response: NOAA has no plans for providing vehicle storage for unmarried ship crewmen and women.

Comment: The cover of the DEIS has no relationship, to the contents. A plain cover would probably be less expensive and more practical for a "draft" publication.

Response: The cover of the DEIS and the FEIS represent views of Puget Sound and Lake Washington. They are fitting illustrations of the context in which the NOAA Center is planned. They depict the qualitative basis for the extensive environmental standards which the NOAA Center must meet. The DEIS was printed professionally in order to supply the large number of copies required, and a hard cover was used since it was expected that the document would be heavily used.

#### Elizabeth Sherris

Comment: A semi-commercial undertaking consisting of cranes, piers and boat repairing machinery will cause pollution of Lake Washigton and disturb peace of surrounding areas. In Part IV, Item A, C, If "localized turbidity" remains for several years, it will certainly destroy benefits that Seattle citizens have worked and paid for.

Response: The characterization in the comment greatly exaggerates the character of the facility NOAA plans and its probable impacts. The NOAA Center will not generate significant, long term disturbances in the surrounding area. Turbidity from dredging and pier construction will be reduced very quickly.

Comment: NOAA's assertion that no pollution of Matthews Beach Park will result from boat repairing facilities is unsatisfactory.

Response: Findings of NOAA environmental studies show that there will be no significant adverse change affecting Matthews Beach Park. The park is some distance north of the NOAA site. Views of land-

scaping planned for the NOAA site will be attractive from Matthews Beach.

#### Lloyd C. Orlob

Comment: The DEIS does not show clear, substantive documentation to support Sand Point as advantageous over NOAA's present Lake Union site where they should remain. Seaport facilities absolutely do not belong on Lake Washington. Construction, maintenance and ship activities will negatively affect aquatic biota; piers and ships will have a negative visual impact on existing residential communities.

Response: These assertions are not sustained by information developed in the EIS process, in the public meeting, in meetings with community groups or with local public officials. On the contrary, all available information indicates clearly that the Sand Point site is the most advantageous for the NOAA Center and the adverse impacts are minimal. Benefits of the NOAA Center at Sand Point outweigh the adverse impacts.

Comment: Dredging, dredging maintenance and filling activities at the site and in the Ship Canal are environmentally unsatisfactory for Lake Washington.

Response: No dredging is contemplated or required to support NOAA's use of the Ship Canal. No filling in Lake Washington is required in connection with the development of the NOAA Center. Dredging as presently planned for the NOAA piers will have only a temporary, low overall adverse impact.

Comment: Bridge openings at the Montlake and University Bridges will cause delays and costs to the motorist and the general public. Response: Bridge openings do cause delays; however, the number of bridge openings attributable to NOAA vessel movements is barely noticeable given the present and anticipated frequency of openings caused by recreational and commercial vessel traffic.

Comment: Increased traffic including truck traffic on Sand Point Way and connecting arterials will result in additions to the traffic lanes, signing and signals near the site, accidents, congestion and noise. Will the city taxpayer assume the cost burden associated with this?

Response: Neither the extent nor the cost of such improvements have yet been determined. NOAA expects to negotiate appropriate traffic improvements with the City.

Comment: The NOAA Facility is incompatible with the existing residential atmosphere (RS 7200).

Response: The portion of the Sand Point site owned by NOAA is identified as appropriate for governmental and educational uses in the City of Seattle Comprehensive Plan. The Seattle Shoreline Master Program identifies research and educational uses as appropriate for the zone proposed for Sand Point.

Research and educational uses are permitted in the RS 7200 zone. There is no apparent conflict with RS 7200 zoning which exists in the Sand Point area.

Comment: Several items are indicated as advantageous in favor of Sand Point: consolidation of facilities, new funds available, new jobs for the area. This information is misleading as these items are not unique to Sand Point.

Response: While these items are not unique to Sand Point, they are likely to be most fully realized through a NOAA Center at Sand Point since the site is the most advantageous for the planned research center development.

Comment: The Haller Lake Improvement Club was not asked to review the DEIS nor did it receive notification of the February 22 public meeting.

Response: Since this community lies a considerable distance away from the Sand Point site, it has not been considered as important a contact as the communities adjacent to Sand Point. A copy of the DEIS was provided to a representative of the Haller Lake Improvement Club and the Club was able to respond with comments within the allotted time. There were considerable news coverage as well as public notice advertisements of the public meeting; this notice appears to have been ample, judging from the number of persons participating in the meeting.

## Jack C. Sweek, Colonel, U.S. Army (Retired)

Comment: The Western Regional Headquarters should designate a representative as a community contact. This contact would have specific responsibility for maintaining an up-to-date list of community representatives and periodically distributing a newsletter to inform them of NOAA actions, plans and proposals.

Response: Sand Point project staff members have been designated and acting as community contact persons. The Community Liaison Committee appointed by the City includes representatives of the key community clubs. Therefore, the goal of the comment has been met.

#### Wheeler C. Grey

Comment: NOAA vessels should not be based at Lake Washington as they will have a deteriorating effect on the recently attained water quality. Would the basing of the vessels in salt water such as Puget Sound in any way inhibit the accomplishment of NOAA's mission and operations?

Response: There is no information which indicates that NOAA vessels will have a significant adverse effect on Lake Washington water quality. METRO officials confirm this assessment. Saltwater berthing of vessels sharply increases maintenance and operation

costs of the vessels. Moreover, suitable saltwater sites for a NOAA Center are unavailable.

Comment: The Final EIS should clarify the means of access to NOAA facilities and the new city park since the U.S. Navy will not permit the use of either the north or south gate.

Response: The access pattern to the NOAA site has been established to the satisfaction of both NOAA and the Navy. See Part III.

Comment: The construction of concrete piers in an urban residential lake constitute an absolute abandonment by NOAA of its mission.

Response: Since a considerable amount of NOAA research activity requires the use of research vessels, adequate pier facilities become a support requirement for NOAA activities.

Comment: The DEIS makes a mistake when it limits its consideration of alternate sites (page 6) to an all or nothing choice among five named sites. The factual basis for deciding on Lake Washington as a site deserves far more justification than appears in the DEIS.

Response: A full range of alternatives was considered, including split sites as well as no action. Based on the considerable information available, the Sand Point site is the most favorable location both from the standpoint of cost as well as site effectiveness.

Comment: What effect will NOAA's vessels have on Beach Clubs and homes they pass on the way to Puget Sound?

Response: Since NOAA vessels would pass 1,000 or more yards away from the Beach Club, no significant adverse effect would occur.

#### Pat Emerson

Comment: The DEIS does not give enough consideration to mitigating measures for adverse impacts of traffic routes and air pollution.

Response: Additional consultant work has

been added to this Statement dealing with traffic and air quality concerns. There are no significant adverse impacts.

Comment: The impact of traffic within surrounding residential neighborhoods is superficially discussed in the DEIS. There is no indication that NOAA will consult with METRO or the city transportation agencies to work out any possible alternate solutions to the traffic problems.

Response: Traffic studies have been revised and expanded, and METRO planning officials have been consulted on alternative traffic strategies.

Comment: The DEIS does not discuss the relationship between NOAA's facility and the other facilities that will or may be established at Sand Point.

Response: Plans for relationships with the Navy and City park officials have progressed considerably since NOAA acquired property at Sand Point. These plans are presented in Part III.

Comment: A discussion of what kinds of permits, such as Shoreline Management Permits, the facility will need is lacking in the DEIS.

Response: NOAA is required to obtain a permit for dredging and over-water construction from the Army Corps of Engineers. No other permits are required, but NOAA intends to review plans and designs with appropriate City departments as a test of compliance with City environmental policies.

#### Ed Server

Comment: NOAA's seagoing ships absolutely are incompatible with Lake Washington. Response: There is no information that supports the assertion that NOAA vessel use of Lake Washington, according to NOAA plans, is incompatible with the present uses of the Lake.

Comment: When the View Ridge Community Club voted in favor of NOAA and the Park, nobody had any idea that ships would be brought into Sand Point. If

another poll were taken, the result would be considerably different.

Response: View Ridge Community Club representatives report that at the time of the vote in support of the NOAA Center, members had been briefed on NOAA plans, including NOAA vessel berthing plans and requirements.

Comment: There is no consideration in the DEIS to what a shipping firm like the Alaska Steamship had done to Lake Washington as NOAA will do to Lake Washington.

Response: Studies of the effects of NOAA's vessels on the lake were based on estimates of activities that could be expected from NOAA ships. A comparison with dissimilar vessels such as commercial vessels would be of limited validity.

Comment: NOAA should hire an outside appraiser or an outside person to study alternate locations for research, shipping and docking facilities.

Response: The suggested work was done by a consulting engineer retained by NOAA, Robert G. Albrecht.

Comment: The DEIS should include the impact of NOAA's traffic over a period of 15 years and what problems will occur when citizens of Seattle start using the park.

Response: Consideration of the impact of the park as well as NOAA Center traffic has been included in the Statement. A fifteen year estimate of traffic impact could not be calculated with significant reliability.

Comment: The DEIS should have included architectural drawings of Figure 32 on the front of the report.

Response: All EIS studies have been undertaken to inform and guide architectural studies. Figure 32 functions as one of such guides.

Comment: The Final EIS should include a resolution among the City of Seattle officials, the U.S. Navy and NOAA as to access into their facilities.

Response: This has been accomplished and is reported in Part III.

### **PART IX**

### **Exhibits**

EXHIBIT A. Four Site Alternatives

EXHIBIT B. City of Seattle Comprehensive Plan for Sand Point Area

EXHIBIT C. NOAA Vessels Inventory for Sand Point

**EXHIBIT D.** Sand Point Community Liaison Committee

**EXHIBIT E.** Water Chemistry

**EXHIBIT F.** Water Quality

EXHIBIT G. Studies by Northwest Consultant Oceanographers,

July 1972 and September 1974

EXHIBIT H. Bird Species Observed at Sand Point

EXHIBIT I. Aquatic Biota Literature Review

EXHIBIT J. Basic Shoreline Habitat Types of Lake Washington

EXHIBIT K. Bottom Survey at Proposed NOS Dock Site

EXHIBIT L. Checklist of Fishes Occurring in the Lake Washington

Drainage

EXHIBIT M. Fish Species, Pontiac Bay, Lake Washington

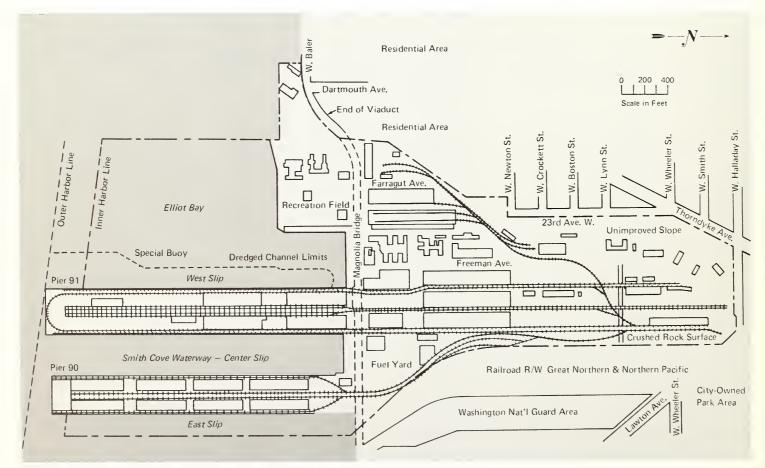


EXHIBIT A. Site Alternative—Piers 90 and 91

EXHIBIT N. Phytoplankton in Lake Washington

EXHIBIT O. Zooplankton in Lake Washington

**EXHIBIT P.** Shoreline Vegetation of the Lake Washington Environs

**EXHIBIT Q.** GSA Construction Noise Standards

EXHIBIT R. Socio-Economic Data

**EXHIBIT S.** Sand Point Area Zoning

**EXHIBIT T.** 1975 AM and PM Peak Traffic (Vehicles per Hour)

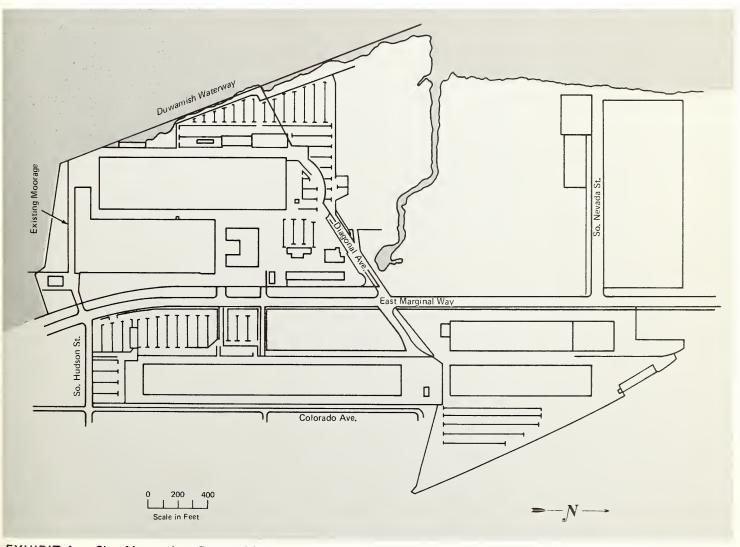


EXHIBIT A. Site Alternative—Duwamish

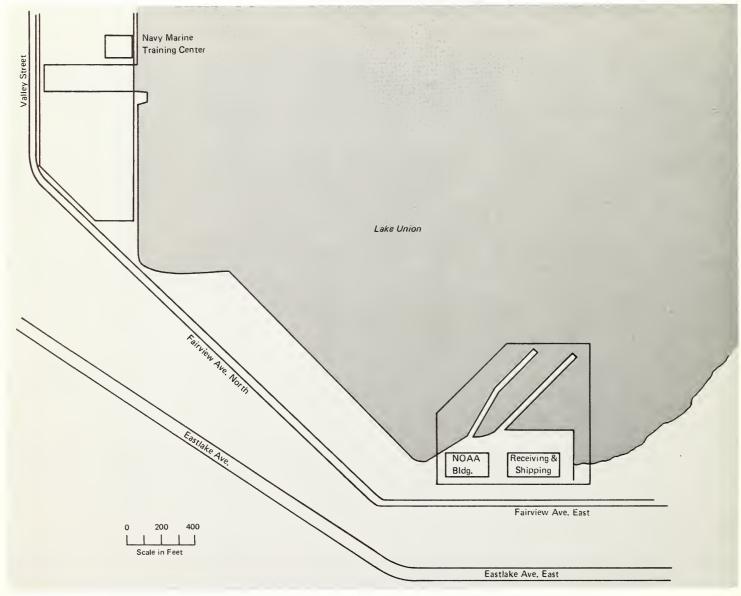


EXHIBIT A. Site Alternative—Lake Union

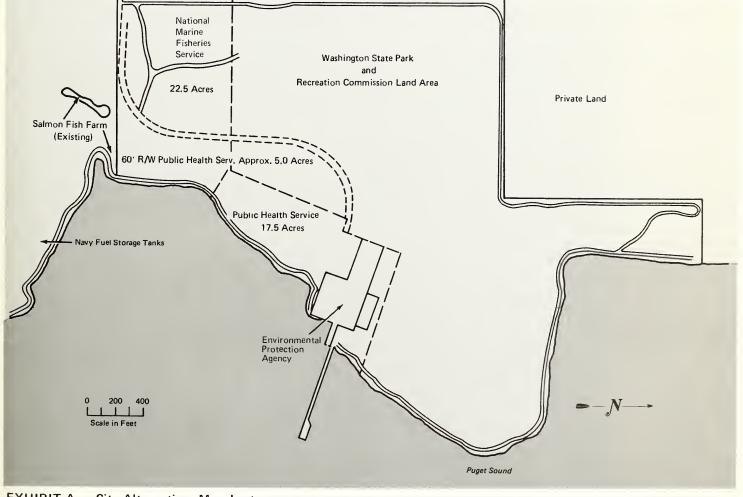


EXHIBIT A. Site Alternative—Manchester

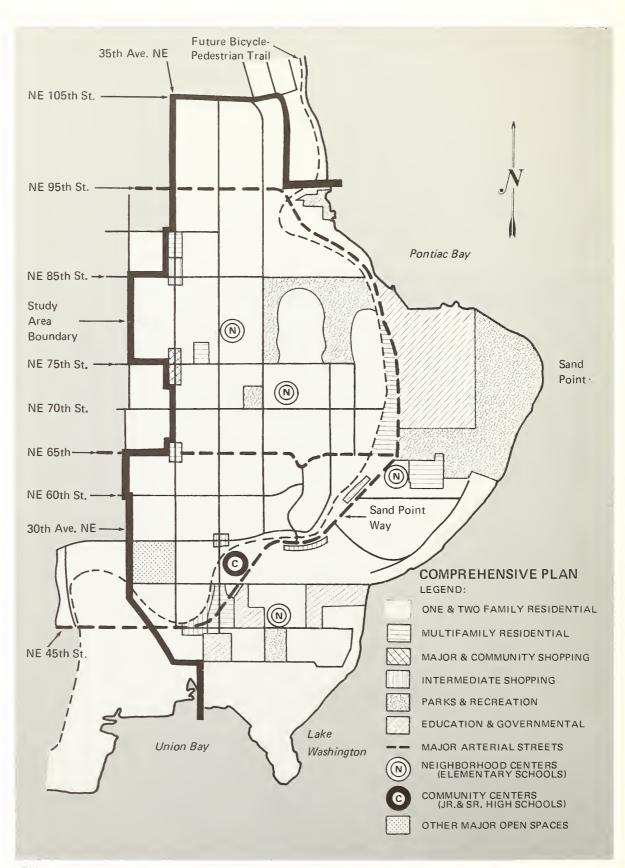


EXHIBIT B. City of Seattle Comprehensive Plan for Sand Point Area

NAME	CREW SIZE	CLASS	HEIGHT ABOVE WATER	LENGTH	BEAM	MAXIMUM DRAFT	POWER SOURCE
*OCEANOGRAPHER	75	ı	126	303	52	18.5	Diesel
*DISCOVERER	75	I	126	303	52	18.5	Diesel
*SURVEYOR	73	1	93	292	46	16	Diesel-Steam
*RAINIER	72	П	115	231	42	13	Diesel
*FAIRWEATHER	72	Н	115	231	42	13	Diesel
*McARTHUR	40	Ш	101	175	38	11.6	Diesel
*DAVIDSON	40	111	101	175	38	11.6	Diesel
*M. FREEMAN	37	П	102	215	42	18	Diesel
NEW VESSEL	25	111	100 Est.	160	36	11	Diesel
MESA VESSEL	25	Ш	100 Est.	160	36	11	Diesel
*COBB	8	V	59	93	25	9	Diesel
OREGON	8	V	62	100	26	14	Diesel

<sup>\*</sup>Presently at PMC, Lake Union Source: NOAA

EXHIBIT C. NOAA Vessels Inventory for Sand Point

REPRESENTING	NAME
Belvedere Terrace	Mr. Frank Greif (Chairperson)
View Ridge	Ms. Dorothy McCormick
Hawthorne Hills	Prof. Demar Irvine
Laurelhurst	Mr. Les Podgorny
Inverness	Prof. Larry Wilets
Sand Point Country Club	Mr. Bill Martin
Seattle City Council	Ms. Jeanette Williams
Meadowbrook	Prof. John Price
Aviation Heights	Mr. Clayton Young
Friends of Sand Point Park	Mr. Blair Bernson
Friends of Sand Point Park	Ms. Inge Strauss
Friends of Sand Point Park	Mr. Tom Miller
Seattle Park Board	Ms. Virginia C. Van Ness
University District and	Jerald E. Farley
University of Washington	Ms. Liz Lang
Matthews Beach	Dr. Robert Charlson

**EXHIBIT D.** Sand Point Community Liaison Committee

							mg ,	1								mg	1							mg /		mg /	l
ITEM	Discharge (cfs)	Dissolved solids	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Carbonate (CO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (CI)	Fluoride (F)	Nitrate $(NO_3)$	Specific conductance (μmho)	Orthophosphate	Total phosphate (PO $_{f 4}$ )	Silica (SiO <sub>2</sub> )	Iron (Fe)	Boron (B)	Hd	Color (standard units)	Turbidity (JCU)	Temperature (°C)	Dissolved oxygen	Oxygen saturation (%)	Total	Noncarbonate	Coliform (MPN)
GREEN RI																											
Maximum Mean	10,900	46 37	6.6 5.1	1.4 0.6	3.3 2.5	0.5 0.2	32 22	0 0	3.8 2.1	1.5 1.0	0.2 0.1	0.9 0.2	62 44	0.06 0.02	_	17.0 13.5	0.58 0.13	0.09 $0.03$	7.5	10	_	18.0	13.1	104	22	2	430
Minimum	156	28	3.4	0.0	2.0	0.0	13	0	1.4	0.5	0.0	0.2	33	0.02	_	11.0	0.00	0.03	6.2	_ 0	_	8.8 2.0	11.2 9.4	100 90	15 10	0 0	114 0
Number	21	21	21	21	19	19	21	4	21	21	20	21	21	18		21	20	4	20	21	_	16	17	16	21	21	17
GREEN RIV	VERATP			V PLAN				R, Octo		and Oc																	
Maximum Mean	_	39 39	5.2 5.1	1.2 1.2	6.9 4.8	0.6 0.6	29 25	_	3.2 2.6	6.3 3.9	0.0 0.0	0.2 0.1	_	_	_	23.0 18.5	0.05 0.02	_	7.4	_	_	-	-	_	18 18	0 0	-
Minimum	_	39	5.1	1.2	2.7	0.6	21	_	2.0	1.6	0.0	0.0	_	_	_	14.0	0.02	_	- 7.4	_	_	_	_	_	17	0	_
Number	_	1	2	2	2	1	2	***	2	2	1	2	-	_	-	2	2	-	1	-	_	_	-	-	2	1	-
GREEN RIV	VER NEAL	RAUB	URN, J	uly 195	59 thre	ough F	ebruar								_												
Maximum	4,600		11.0	3.1	6.0		50	0	6.4	3.8	0.3	1.9	103	0.13	_		1.20		7.9	15	40	24.2	14.1	132	39	0	24,000
Mean	172	51	7.1	1.6 0.5	3.6 2.2	0.5 0.0	32 20	0 0	3.8 2.0	1.7 0.0	0.1 0.0	0.7 0.0	67 38	0.03 $0.00$	-	13.2 9.6	0.24 0.00	0.01 0.00	6.2	_ 0	_ 0	10.1 3.5	11.1 8.3	101 81	24 14	0 0	1,225 0
Minimum Number	172 63	30 84	4.0 84	84	84	84	84	33	84	84	84	84	84	73	_	84	71	13	84	83	45	87	88	87	84	84	86
GREEN RIV				toher 1	962 #	rough	Δnril	1966																			
Maximum	_	116	20.0	20.0		1.7	68	0	9.8	19.0	0.2	4.5	954	0.89	_	18.0	1.70	0.09	7.6	30	70	20.0	12.7	112	133	78	240,000
Mean	_	72	9.0	3.0	7.4	1.0	41	0	5.7	6.8	0.1	2.0	121	0.21	-	14.5	0.58	0.03	_	-	~	10.6	9.7	89	35	2	17,289
Minimum	_	34	4.5	0.5 48	2.7 47	0.1 47	22 48	0 31	2.0 47	1.2 47	0.0 47	0.4 47	46 48	0.05 35	_	11.0	0.29	0.01	6.6	0 47	5	4.5	6.2	66	16	0	230
Number		47	48						47	47	47	41	40	35		48	- 34		48	47	36	50	51	50	48	48	50
CEDAR RIN	VERALK 1,920	77	12.0	1959 ti 3.7	hrougt 5.0	n Marc 0.9	n 1966 58	0	6.0	2.2	0.1	1.9	112	0.28	_	15.0	1.30	0.06	7 9	10	25	22.8	12.5	118	46	0	4,600
Mean	-	44	7.3	1.4	2.6	0.4	31	0	3.1	1.2	0.1	0.5	62	0.03	_	11.3	0.15	0.02	_	-	_	10.6	10.8	100	24	0	420
Minimum	67	34	5.0	0.6	1.6	0.0	22	0	1.6	0.5	0.0	0.0	46	0.00	_	8.8	0.00	0.00	6.9	0	0	4.1	7.6	77	16	0	0
Number	39	46	46	46	46	46	46	19	46	46	46	46	46	43		46	43	13	46	46	16	50	51	50	46	46	50
CEDAR RIV										2.2	0.2	0.0	70	0.04	_	12.0	0.24	0.01	7.0			14.5	12.5	100	2.1	2	220
Maximum Mean	1,800	51 39	11.0 7.1	1.6 0.8	2.2 1.7	0.5 0.3	39 27	0 0	4.0 2.0	2.2 1.0	0.2 0.0	0.6 0.2	73 53	0.04 0.01	_	12.0 10.1	0.24 0.05	0.01 0.00	7.8	5	0	14.5 9.3	12.5 11.1	106 101	31 21	2 0	230 34
Minimum	335	27	5.0	0.0	1.2	0.0	18	0	0.0	0.5	0.0	0.0	37	0.00		4.0	0.00	0.00	7.0	0	0	5.3	9.7	93	14	0	0
Number	21	23	23	23	21	21	23	9	23	23	22	23	21	21	-	23	22	4	22	22	4	20	21	20	23	22	21
SAMMAMIS	SH RIVER	AT BC	THELI	L, July	1959	throug	h Mar	ch 1966																			
Maximum	1,070	100	12.0	6.6	7.2	2.1	62 45	0	16.0	4.5	0.5	6.3	145	0.44	-	17.0	2.40		7.4	40	120	23.6	12.5	119	55	15	11,000
Mean Minimum	- 8	71 57	9.2 7.5	4.0 2.5	5.2 3.5	1.2 0.7	32	0 0	9.0 6.6	3.0 1.0	0.1 0.0	1.8 0.3	105 82	0.10 0.00	_	10.6 5.1	0.49	0.01	6.6	_ 5	_ 5	12.2 5.0	9.9 7.3	95 80	39 31	3 0	1,788 91
Number	43	53	53	53	53	53	53	14	58	53	53	53	53	50	_	53	50	11	53	53	22	57	57	57	53	53	56
ISSAQUAH	CREEK N	EAR I	SSAQU	AH, N	ovemb	er 196	4 thro	ugh Api	ril 1966																	-	
Maximum	-	94	12.0	5.1	7.6	1.2	68	0	12.0	5.0	0.2	6.2	138	0.99	-	20.0	2.60		7.2	20	350	13.3	12.2	105	53	6	24,000
Mean	-	73	9.7	3.6	5.6	0.8	46	0	7.3	2.7	0.1	3.1	104	0.41	_	15.9	0.73	0.03	-		_	9.2	10.7	96	39	2	10,826
Minimum Number	_	52 22	6.6 22	2.2 22	3.5 22	0.4 22	23 22	0 22	5.4 22	1.8 22	0.1 22	1.5 22	67 22	0.08 11	_	12.0 22	0.06	0.02	6.3 22	5	5 11	5.8 9	8.9 9	85 9	23 22	0 22	36 9
BIG SOOS (										ough Ap																	
Maximum	484	81	12.0	4.6	6.3	1.8	58	0	12.0	ougn Ap 3.5	0.5	3.7	115	0.19	_	20.0	0.46	0.05	7.7	60	10	15.6	12.8	121	45	6	24,000
Mean	_	71	9.5	3.4	5.4	1.0	45	0	8.6	2.2	0.1	1.7	101	0.06	_	14.6	0.14	0.03	_	-	-	9.8	11.0	100	38	1	1,130
Minimum	20	62	7.5	1.2 45	4.4 45	0.5 45	.31 46	0 23	5.8 45	1.0 45	0.0 45	0.6 46	88 46	0.02 34	_	11.0	0.03	0.00	6.8	5 46	0	3.6	9.4	88	30	0	0
Number	24	46	45									40	40	34		45		8	46	46	33	49	49	49	46	46	48
LAKE WAS Maximum	HING TON	333	14.0		87.0	LE, Oc 4.6	tober 48	1964 th 0	rough Si 28.0	eptembe 152.0	r 1965 0.1	5.9	650	0.29	_	7.9	0.25	0.10	7.5	5	25	20.4	12.5	123	92	53	4,600
Mean	_	174	10.3	7.5	39.9	2.4	41	0	16.3	66.9	0.1	2.3	330	0.23	_	4.4	0.23	0.10	_		_	12.6	9.7	93	57	23	1,866
Minimum	_	62	8.4	3.4	6.4	1.1	36	0	8.0	6.5	0.0	1.2	108	0.13	_	1.1	0.08	0.04	6.8	5	0	2.5	7.5	73	35	5	36
Number	_	12	12	12	12	12	12	12	12	12	12	12	12	12	_	12	12	2	12	12	12	12	12	12	12	12	12

Source: Puget Sound Task Force Pacific Northwest River Basins Commission Appendix XIII

Use Intensity L-Light							_										SS						<b>FTING</b>	
M-Medium							Fish				g					g	netic						RA	
H—Heavy	ASSIGNED	FISHERIES	Salmonoid	Migration	Rearing	Spawning	Warm Water Game	Rearing	Spawning	Other Food Fish	Commercial Fishing	Shellfish	LDLIFE	CREATION	Water Contact	Boating and Fishing	Environment Aesthetics	WATER SUPPLY	Domestic	Industrial	gricultural	NAVIGATION	G STORAGE &	HYDRO POWER
WATERCOURSE	CLASS	표	Sal		<u> </u>	S	Wa	ш.		₹	ဒိ	S	≶	RE	Wa	Bo	Ē	×	00	Ĕ	Ag	N	10	Ŧ
Strait of Juan de Fuca and Puget Sound	AA			Н	Н				M	Н	Н	н	L		L	Н	Н			M		Н	М	
Elliott Bay	Α			Н	Н					M	L	М	L		L	M	Н			L		Н		
Duwamish River, Mouth to Black River Junction	В			Н	Н											L	L			L		Н		
Duwamish River, Black River Junction to Limit of Tidal Influence	А			Н	Н											M	M			L		L		
Green River, Limit of Tidal Influence to Headwaters	AA*			Н	Н	M							Н		L	M	Н		Н	Н	L			
Cedar River	A*			Н	Н	Н							M			L	L		Н	Н				M
Sammamish River	A*			Н	Н	Н							L			M	M				L			
Issaquah Creek	<b>A</b> *			Н	Н	Н							M			M	M							
Lake Washington	A*			Н	Н	Н		M	M				L		Н	Н	Н						L	
Lake Sammamish	A*							M	M	M			L		M	M	M							

<sup>\*</sup>Not presently classified. Equal to existing quality.

Source: Puget Sound Task Force, Pacific Northwest River Basins Commission, Appendix XIII.

### **EXHIBIT F.** Water Quality

### NORTHWEST CONSULTANT OCEANOGRAPHERS

### FIELD COLLECTION AND CHEMICAL ANALYSIS OF SEDIMENT SAMPLES TAKEN IN VICINITY OF NOAA PROPOSED SAND POINT LOCATION, LAKE WASHINGTON, July 17, 1972

Northwest Consultant Oceanographers collected seven bottom samples in Lake Washington off the north end of the runway at the former Sand Point Naval Air Station during the morning of 17 July 1972. A 0.3 van Veen grab sampler was used to obtain about three kilograms of the upper 10cm of bottom sediments. A chart showing the location of the samples is attached. Immediately after collection the samples were taken to Food, Chemical and Research Laboratories, Inc. of Seattle (Q. P. Peniston, PhD, President) for analysis. A copy of their report and methods of analyses is appended. Techniques used for collection of the bottom samples and for chemical analyses were in accordance with accepted technique and may be duplicated at any later date. The dried residuals of the samples have been returned to Capt. Robert Williams for future reference.

/s/ E. E. Collias August 4, 1972

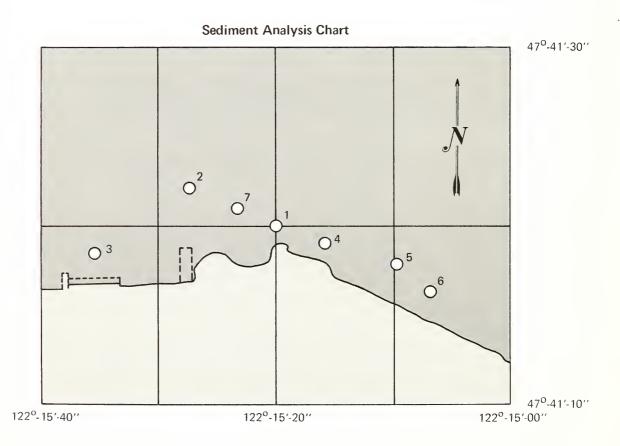


EXHIBIT G. Study by Northwest Consultant Oceanographers, July 1972

### NORTHWEST CONSULTANT OCEANOGRAPHERS

### FIELD COLLECTION AND CHEMICAL ANALYSIS OF SEDIMENT SAMPLES TAKEN IN VICINITY OF NOAA PROPOSED SAND POINT LOCATION, LAKE WASHINGTON, September 26-27, 1974

During the period 26-27 September 1974, Northwest Consultant Oceanographers completed the second phase of their continuing Lake Washington sampling program for the Department of Commerce (NOAA). The initial phase for this project was completed in 1972 (see NCO rept. "A Chemical Analysis of Sediment Samples Collected off North Runway, Sand Point, Lake Washington, 17 July '72)

Gravity core samples were collected employing the NOAA NMFS vessel Harold W. Streeter, John Hughes Officer-in-Charge. During this program the weather was clear with winds ranging from 5–15 kts by the end of the collecting period and shifting from WNW to ENE. In conformance with the contract specifications, stations # 4, 5, and 6 were occupied by STREETER.

NCO employed a standard gravity corer with a 6 foot barrel and a 1.5 inch barrel diameter. Drop weights were varied from 100 to 290 pounds in order to achieve effective penetration of the sediments. Seven drops were made at station # 4, eleven drops at station # 5, and ten drops at station # 6 for a total of 28 drops. Sediment recovered core lengths varied from 25 cm at station # 4 to 6 cm at station # 6. All stations and drops considered a total of 19 "dry" cores were obtained. It is our opinion, based on observed results, that the lake bottom has an exceedingly hard layer just below a thin sediment overburden, such layer is essentially unpenetrable by gravity corering equipment. We further note that dropping a 290 pound corer from a height of 50 feet obtained less than 5 cm of sediment upon striking this layer. To confirm this field observation, the vessel STREETER was positioned in water depths varying from 15 to 33 feet and no better results were obtained when the corer struck this dense layer.

All core samples were preserved by placing in cold storage for further delivery to the analysis laboratory, within 24-hours after collection.

A standard hollow-auger drill rig was employed to collect core samples from a shoreline position in the middle of the interest area or just ashore from station # 5. Employing a stainless steel Shelby tube (1.5" in diameter) a series of documented core samples were taken as indicated in the text. First "Refusal" was noted at a depth of 10.0 feet and the dense layer material appeared to be very similar to that observed in the lake during the boat operations.

This dense layer of compacted fine clays and silts is similar to the Vashon Strata which characterizes many parts of Puget Sound. At the drill position the thickness of this rather uniform layer was about 11 feet. We noted that when a small sample of the layer was placed in Lake Washington, a very fine suspension was witnessed which did not precipitate measurably within 90 min. In the event dredging operations are undertaken through this clay layer, it would seem reasonable to expect much water clouding resulting from the fines in suspension. Further, NOAA might consider the use of some precipitate substances such as CHITOSAN or SEACLEAR see Pacific Northwest SEA Vol 6, No. 1 1973.

Below the dense layer, previously cited, and at a depth of 21.0 feet coarse sand mixed with silt was again encountered. This mixture continued uniformly to a depth of 27.0 feet when a coarse white and black mixture of sands were met, possibly some fraction of the basement rock.

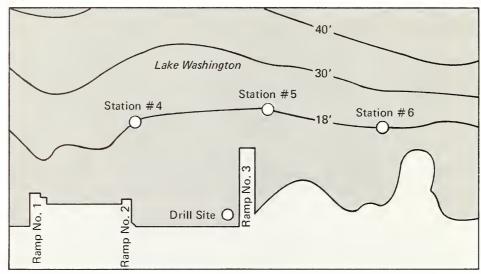
Selected drill-core samples and all gravity-core samples were then taken immediately to the Food, Chemical, and Research Laboratories Inc., of Seattle, for analysis. A copy of their report, citing analytic methods, is attached.

/s/ E. E. Collias

/s/ R. H. Sullivan

Exhibits:

Plan View of the General Area Indicating Gravity Core and Drill Station Sites, September 1974 Study



#### GRAVITY CORE SAMPLES, LAKE WASHINGTON

#### Station # 4 (7-drops, max. sample depth 25 cm)

Code: I-1 Top Section I-2 Mid Section I-3 Bot Section

Station #5 (10-drops, max. sample depth 18 cm)

Code: II-1 Top Section
II-2 Mid Section
II-3 Bot Section

Station # 6 (11-drops, max. sample depth 6 cm)

Code: III-1 Top Section

#### DRILL CORE SAMPLES, SHORELINE, LAKE WASHINGTON

Code	Depth (ft.)	Chem. Anal.	Description
SURF-1	1.0	Yes	Co. Snd. & Silt, grey
IV-1	2.5	No	Fn. grey sand & silt
IV-2	3.5	Yes	Same
IV-3	4.0	No	Med. grey sand & silt
IV-4	6.0	Yes	Med. Br. sand & silt
IV-5	7.5	No	Same
IV-6	10.0	Yes	"Refusal" Fn gry. clay
IV-7	12.5	No	Fn. gry clay & silt
IV-8	15.0	Yes	Same
IV-9	17.5	No	Same
IV-10	20.0	Yes	Same
IV-11	22.5	No	Med. gry snd & silt
IV-12	25.0	Yes	Same, poss. organic
IV-13	27.5	No	Co. Bl. & Wh. snd., poss. granitic

Note: Drilled to 28 feet, though last sample recovered was IV-13.

Refusal is defined: Less than 12 inches of penetration after a core tube (eg. Shelby) is

struck 100 blows by a 140 pound hammer falling a height of 3 inches.

Food, Chemical & Research Laboratories, Inc. 4900 Ninth Ave., N.W. Seattle, Washington, 98107/SUnset 3-4700

Lab. No. 4639 October 24, 1974

Northwest Consultant Oceanographers Box 15310 Wedgewood Station Seattle, Washington

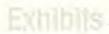
Attention: Mr. E. E. Colias

# LAKE WASHINGTON SEDIMENT SAMPLES FOR ANALYSIS, Samples received September 27, 1974 (Samples #14) All results calculated on a dry weight basis

#### **RESULTS**

Sample  IV-2 IV-4 IV-6 IV-3 IV-10 IV-12 III-1	% Moisture	% Volatile		ppı	m
Sample	as received	solids	% Iron	Zinc	Lead
IV-2	31.5	2.0	13.6	0	0.31
IV-4	26.0	1.2	11.6	0	3.88
IV-6	26.4	1.5	14.4	0	1.50
IV-3	19.0	1.7	15.4	0	1.62
IV-10	21.5	1.4	11.8	0	2.10
IV-12	20.8	3.0	9.6	1.65	4.15
III-1	18.0	1.1	13.4	0	1.73
II-1	14.6	1.1	4.2	0	1.08
11-2	10.5	1.7	16.4	0	2.77
11-3	13.7	1.6	10.9	0	0.66
I-1	13.8	2.3	5.9	0	0.87
1-2	11.1	2.0	6.2	0	3.00
1-3	17.7	3.0	7.4	0	1.01
Surf-1	10.7	2.1	9.6	9.06	5.97

			ppm			
Sample	Oil & grease	Mercury	Cobalt	Arsenic	Antimony	Copper
IV-2	trace	0.013	9.3	0.7	<1	0.19
IV-4	176	0.009	15.0	0.5	<1	0.76
IV-6	trace	0.014	14.6	0.5	<1	0.38
IV-8	trace	0.080	2.5	0.9	<1	0
IV-10	trace	0.025	8.3	0.9	<1	0.53
IV-12	trace	0.034	5.7	0.5	<1	0.23
111-1	trace	0.015	13.8	1.5	<1	0
II-1	0	0.005	5.1	0.7	<1	0.13
11-2	trace	0.017	11.2	0	<1	0.25
11-3	0	0.081	4.8	0.4	<1	0
I-1	trace	0.111	18.7	0	<1	0
1-2	0	0.020	17.9	0.1	<1	0.43
1-3	0	0.005	15.5	1.3	<1	0
Surf-1	594	0.173	1.8	1.1	<1	0.56



#### References for Analysis:

Volatile solids: Standard Method for the Examination of Water and Wastewater, 13th Edition, pg. 536

Iron: Quantitative Analysis edited by G. M. Smith, MacMillan Co., pg. 125

Zinc: Polaragraph Lead: Polaragraph Copper: Polaragraph

Mercury: Schoniger Combustion Method
Oil & grease: Standard Methods pg. 254

Cobalt: Thiocyanate Method from Colorimetric Determination of Traces of Metals, Edited by Sandell. 1944

Antimony: AOAC, 11th Edition, 1970, pg. 399, Procedure 25.001–25.005 Arsenic: AOAC, 11th Edition, 1970, pg. 399, Procedure 25.006–25.010

#### PESTICIDE RESIDUES IN ppm (DRY WEIGHT)

Sample	Lindane	Heptachlor	Aldrin	Deildrin	P,PDDE	P,PTDE	P,PDDT
MDL	0.001	0.001	0.001	0.001	0.0005	0.002	0.004
1-1	TR	ΝD	0.004	ND	0.0005	ΤR	ND
1-2	TR	ND	0.002	ND	0.0006	TR	TR
1-3	TR	ND	0.002	ND	0.0006	TR	TR
11-1	TR	ND	0.002	ND	0.0005	N D	ND
11-2	0.005	TR	0.002	ND	TR	ND	ND
11-3	TR	TR	0.002	ND	TR	TR	ND
III-1	TR	TR	0.001	ND	0.0018	0.002	TR
IV-2	N D	ND	ND	ND	N D	ND	ND
IV-4	ND	ND	ND	ND	N D	ND	ND
IV-6	ND	ND	TR	ND	N D	ND	ND
IV-8	ND	ND	0.0013	ND	TR	ND	ND
IV-10	ND	ND	0.0017	ND	TR	ND	ND
IV-12	T R	TR	0.0019	ND	0.002	TR	ΤR
Surf 1	TR	ND	ND	ND	ND	ND	ND

MDL = minimum detectable level

N D = none detected, or less than  $\frac{1}{2}$  minimum detectable level T R = trace, equal to or less than the minimal detectable level

FOOD, CHEMICAL RESEARCH LABORATORIES, INC.

/s/ Quintin P. Peniston

amd

#### Species commonly seen on Sand Point and in adjacent waters:

Common Snipe

Least Sandpiper

Snowy Owl

Marsh Hawk

Western Sandpiper

Ring-necked Pheasant Short-eared Owl

Western Grebe
Horned Grebe
Pied-billed Grebe
Canada Goose
Mallard Duck
Greater Scaup Duck
Lesser Scaup Duck
Common Goldeneye Duck

Common Goldeneye Duck

Barrow's Goldeneye Duck

Robin

Rufflehead Duck

Crow (Common)

Bufflehead Duck Crow (Common)
Red-breasted Merganser Brewer's Blackbird
Ruddy Duck Red-winged Blackbird

Canvasback Duck Starling American Coot Western Meadowlark

Glaucous-winged Gull Violet-green Swallow Bonapart's Gull Tree Swallow

Mew GullRough-winged SwallowHerring GullCliff SwallowThayer's GullBarn SwallowCalifornia GullRock DoveCommon TernMourning DoveKilldeerHouse SparrowSpotted SandpiperSavannah Sparrow

Song Sparrow Ruby-crowned Kinglet White-crowned Sparrow Northwestern Crow

#### Species observed on Sand Point, but more common to other habitats:

California QuailFox SparrowTree SparrowRufous-sided TowheeCommon MerganserCommon BushtitCommon LoonBlack-capped ChickadeeSurf ScoterHorned LarkWhite-winged ScoterOregon JuncoRed-tailed HawkWater Pipit

Turkey Vulture
Pintail Duck
American Widgeon Duck
Common Flicker (red-shafted type)

Lapland Longspur
Snow Bunting
Red-necked Grebe
Redhead Duck

Golden-crowned Sparrow Yellow-rumped Warbler (Audubon type)

Spelling and names according to: "Washington Birds," Larrison & Sonnenberg, 1968 and the American Ornithologists' Union.

Source: Records of the Seattle Audubon Society and personal observation of H. Blair Bernson, member, Seattle Audubon Society, April 1974.

In preparation for Aquatic Biota Studies of Sand Point, NOAA commissioned a review of relevant studies by Michael F. Shepard. The following studies were found to have potential utility in the study:

Ajwani, S. 1956. A review of Lake Washington watershed, historical, biological, and limnological. M.S. Thesis. Univ. Washington, Seattle. 148 p.

Bartoo, N. 1972. The vertical and horizontal distribution of northern squawfish (*Ptychocheilus oregonensis*), peamouth (*Mylocheilus caurinus*), yellow perch (*Perca flavescens*), and adult sockeye salmon (*Oncorhynchus nerka*) in Lake Washington. M.S. Thesis, Univ. of Washington, Seattle. 60 p.

Benson, W. W. 1967. A study of the periphyton of Lake Washington. M.S. Thesis, Univ. of Washington, Seattle. 88 p.

Costa, R. H. 1973. The food and chronology of yellow perch (*Perca flavescens*) in Lake Washington. Unpubl. Ms., Coll. of Fish., Univ. of Washington, Seattle. 20 p.

Edmondson, W. T. 1956. The relation of photosynthesis by phytoplankton to light in lakes. Ecology 37(1): 161-174.

Hansen, R. G. 1970. Some fish species available from benthic gill net sets in Pontiac Bay, Lake Washington. Unpubl. Ms. (Fish 499 - Prof. Wydoski), Coll. of Fish., Univ. Washington, Seattle. 13 p.

Hill, C. W., Jr. 1962. Observations on the life histories of the peamouth (*Mylocheilus caurinus*) and the northern squawfish (*Ptychocheilus oregonensis*) in Montana. Proc. Mont. Acad. Sci. 22: 27-44.

Hutchinson, J. E. 1931. History of the Sand Point Naval Air Station. M.A. Thesis, Univ. Washington, Seattle. 105 p.

Ikusemiju, K. 1967. The life history and ecology of *Cottus* sp. in Lake Washington. M.S. Thesis, Univ. Washington, Seattle. 145 p.

Jenkin, P. M. 1930. Oxygen production by the diatom (Coscino-discus excentricus) Ehr. in relation to submarine illumination in the English Channel. Jour. Mar. Biol. Assoc. 22: 301-343.

Jorgensen, E. G. 1969. The adaption of plankton algae IV. Light adaption in different algal species. Physiol. Plant. 22(6): 1307-1315.

Lund, J. W. G. 1949. Studies on Asterionella. 1. The origin and nature of the cells producing seasonal maxima.

Manning, W. A. and R. E. Juday. 1941. The chlorophyll content and productivity of some lakes in northeastern Wisconsin. Trans. Wisc. Acad. Sci. Arts Lett., 33: 363-393.

Mercer, R. W. 1972. An attempt to locate the spawning sites of northern squawfish and to tag squawfish in Lake Washington. Unpubl. Ms. (Fish 499 - Prof. Wydoski) Coll. Fish., Univ. Washington, Seattle. 5 p.

Nielsen, S. 1962. Inactivation of the photochemical mechanism in photosynthesis as a means to protect the cells against too high light intensities. Physiol. Plant. 15: 161-171.

Nishimoto, M. L. 1972. Lake Washington's shoreline habitat. Unpubl. Ms. (Fish 600-Prof. Wydoski) Coll. Fish., Univ. Washington, Seattle. 7 p.

Nishimoto, M. L. 1973. Life history of the peamouth (*Mylocheilus caurinus*) in Lake Washington. M.S. Thesis, Univ. Washington, Seattle. 73 p.

Northwest Consultant Oceanographers. 1972 and 1974. A chemical analysis of sediment samples collected off north runway, Sand Point, Lake Washington. Report prepared for the National Oceanic and Atmospheric Administration by Northwest Consultant Engineers, Seattle, Washington.

Olney, F. E. 1971. Contributions to the life history of the northern squawfish (*Ptychocheilus oregonensis*) in Lake Washington. Unpubl. Ms. (Fish 499 - Prof. Wydoski), Coll. Fish., Univ. Washington, Seattle. 16 p. and appendix.

Scheffer, V. B. and R. J. Robinson. 1939. A limnological study of Lake Washington. Ecol. Monogr. 9(1): 95-143.

Schomer, H. A. and C. Juday. 1935. Photosynthesis of algae at different depths in some lakes of Northeastern Wisconsin. I. Observations of 1933. Trans. Wisc. Acad. Sci. Arts Lett. 29: 173-193.

Schultz, L. P. 1935. The spawning habits of the chub, *Mylocheilus caurinus*, a forage fish of some value. Trans. Am. Fish. Soc. 65: 143-147.

Stein, J. N. 1970. A study of the largemouth bass population in Lake Washington. M.S. Thesis, Univ. Washington, Seattle. 69 p.

Woodey, J. C. 1966. Sockeye salmon spawning grounds and adult returns in the Lake Washington watershed, 1965. M.S. Thesis, Univ. Washington, Seattle. 101 p.

Wydoski, R. S. 1972. Checklist of fishes occurring in the Lake Washington drainage. Intern. Rept. 34, Coniferous Forest Biome. Univ. Wash., AR-10, Seattle. (In press.)

Wydoski, R. S. 1972. Annotated bibliography on the ecology of the Lake Washington drainage. Coniferous For. Biome, Ecosystem Analysis Studies, U.S. International Biological Programs, Bull. No. 1. 102 p.

References cited in the Shepard and Patten Aquatic Biota reports were:

#### Shepard:

Bailey, R. M. (Chairman, Committee on Names of Fishes). 1970. A list of common and scientific names of fishes from the United States and Canada. 3rd Ed., Am. Fish. Soc., Spec. Publ. No. 6. 149 p.

Bartoo, N. 1972. The vertical and horizontal distribution of northern squawfish (*Ptychocheilus oregonensis*), peamouth (*Mylocheilus caurinus*), yellow perch (*Perca flavescens*), and adult sockeye salmon (*Oncorhyncus nerka*), in Lake Washington. M.S. Thesis, Univ. Washington, Seattle. 60 p.

Bartoo, N. W., R. G. Hansen, and R. S. Wydoski. 1973. A portable vertical gill net system. Contrib. No. 10, U.S./IBP Coniferous Forest Biome, Univ. Washington, AR-10, Seattle.

Burns, J. W. 1966. Carp, p. 510-515. In A. Calhoun (Ed.) Inland Fisheries Management. Calif. Dept. of Fish and Game.

Carl, G. C., W. A. Clemens, and C. C. Lindsey. 1973. The fresh-water fishes of British Columbia. K. M. MacDonald, Queens Printer, Victoria, British Columbia. 192 p.

Clemens, W. A. and G. V. Wilby. 1961. Fishes of the Pacific Coast of Canada. Fish. Res. Bd. Canada, Bull. 68, 443 p.

Coots, M. 1966. Yellow perch, p. 426-430. *In* A. Calhoun (ED.) Inland Fisheries Management. Calif. Dept. of Fish and Game.

Costa, H. H. 1973. The food and feeding chronology of yellow perch (*Perca flavescens*) in Lake Washington. Unpub. ms., Univ. Washington. 19 p. (typewritten).

**Dryfoos**, R. L. 1965. The life history and ecology of the longfin smelt in Lake Washington. Ph.D. Thesis, Univ. Washington, Seattle. 159 p.

Emig, J. W. 1966. Largemouth bass, p. 332-353. *In* A. Calhoun (Ed.) Inland Fisheries Management. Calif. Dept. of Fish and Game.

Hansen, R.G. 1972. The selectivity of vertical and horizontal monofilament gill nets for peamouth, yellow perch, and northern squawfish in Lake Washington. M.S. Thesis, Univ. Washington. 87 p.

Hubbell, P. M. 1966. Pumpkinseed sunfish, p. 402-404. *In* A. Calhoun (Ed.) Inland Fisheries Management. Calif. Dept. of Fish and Game.

Imamura, K. I. 1975. Life history of the brown bullhead (*Ictalurus nebulosus*) in Lake Washington. M.S. Thesis, Univ. Washington, Seattle. 78 p.

Jenkins, R. M. 1968. The influence of some environmental factors on standing crop and harvest of fishes in U.S. reservoirs. Reservoir Fish. Resources Symposium. Bur. Sport Fish. & Wildlife. 23 p.

Jeppson, P. W. 1957. The control of squawfish by the use of dynamite. Progr. Fish Culturist. 19(4): 168-171.

McPhail, J. D., and C. C. Lindsey. 1970. Freshwater fishes of northwestern Canada and Alaska. Fish. Res. Bd. Canada, Bull. 173. 381 p.

Moulton, L. 1970. The 1970 longfin smelt spawning run in Lake Washington with notes on egg development and changes in the population since 1964. M.S. Thesis, Univ. Washington, Seattle. 84 p.

Nikolsky, G.V. 1963. The ecology of fishes. Academic Press, London and New York. 352 p.

Nishimoto, M. L. 1973. Life history of the peamouth (Mylocheilus

caurinus) in Lake Washington. M.S. Thesis, Univ. Washington, Seattle. 73 p.

Olney, F. D. 1975. Life history and ecology of the northern squawfish, *Ptychocheilus oregonensis* (Richardson) in Lake Washington. M.S. Thesis, Univ. Washington, Seattle. 75 p.

Patten, B. G. and D. T. Rodman. 1969. Reproductive behavior of northern squawfish (*Ptychocheilus oregonensis*). Trans. Amer. Fish. Soc. 98(1): 108-110.

Schultz, L. P. 1935. The spawning habits of the chub, *Mylocheilus caurinus*, a forage fish of some value. Trans. Amer. Fish. Soc. 65: 143-147.

Stein, J. N. 1970. A study of the largemouth bass population in Lake Washington. M.S. Thesis, Univ. Washington, Seattle. 69 p.

Woodey, J. C. 1966. Sockeye salmon spawning grounds and adult returns in the Lake Washington watershed, 1965. M.S. Thesis, Univ. Washington, Seattle. 101 p.

Woodey, J. C. 1972. Distribution, feeding, and growth of juvenile sockeye salmon in Lake Washington. Ph.D. Thesis, Univ. Washington, Seattle. 207 p.

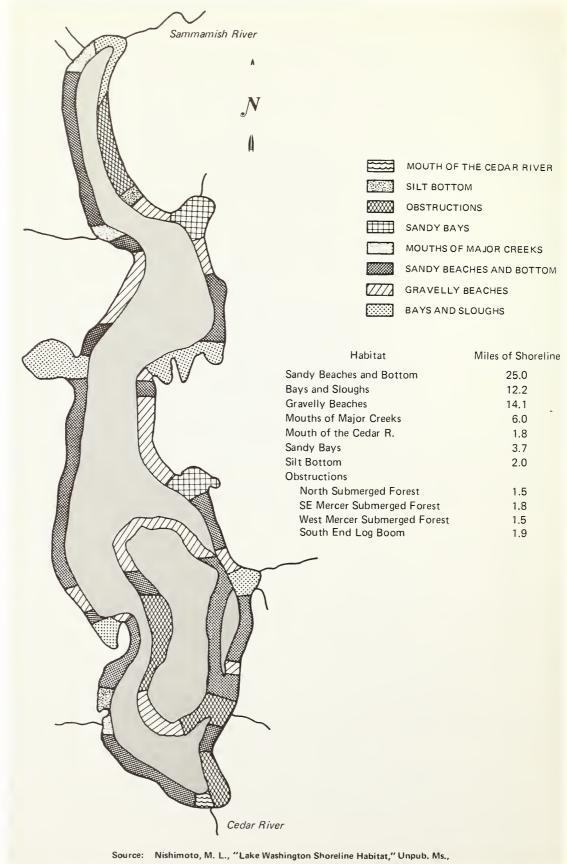
#### Patten:

Gould, H. R. and T. F. Budinger. 1958. Control of sedimentation and bottom configuration by convection currents, Lake Washington. J. Mar. Res. 17: 183-198.

Thut, R. N. 1966. A study of the profundal bottom fauna of Lake Washington. M.S. Thesis, Univ. Washington, Seattle.

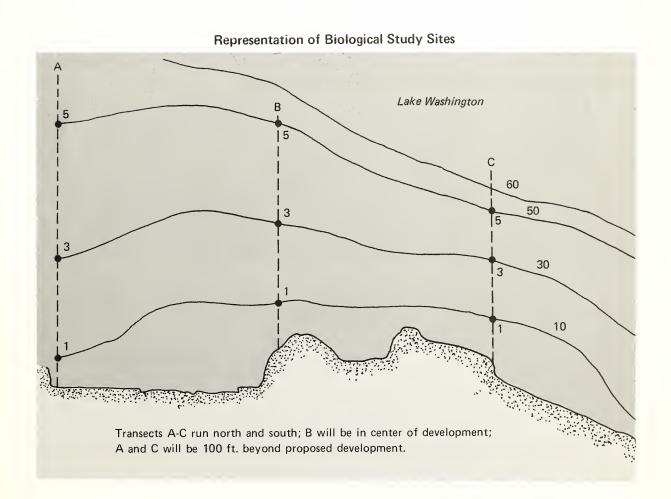
Scheffer, V. B. 1936. The plankton of Lake Washington. Ph.D. Thesis, Univ. Washington, Seattle. 110 p.

Kost, A. L. B. and A. W. Knight. 1975. The food of *Neomysis mercedis* Holms in the Sacramento-San Joaquin estuary. Cal. F and G 61: 35-46.



College of Fisheries, University of Washington, Seattle, 1972.

EXHIBIT J. Basic Shoreline Habitat Types of Lake Washington





#### U.S. DEPARTMENT OF COMMERCE National Oceanic and Atmospheric Administration NATIONAL MARINE FISHERIES SERVICE Northwest Fisheries Center

Date

November 21, 1972

Reply to Attn. of: F77

Τo

Fll, Dr. Bruce McAlister, Deputy Director, Division of MF&S

From

William L. High, Fishery Biologist

Subject

Bottom Survey at Proposed NOS Dock Site

On November 21, 1972, an underwater research team composed of William L. High (Fishery Biologist), Rich Ulhorn (Oceanographic Technician), Dave Holland (Fishery Biologist) and Bob Loghry (Biological Technician-Fisheries) conducted a fauna survey along the north shore of the Sand Point Naval Air Station.

Two diver teams independently swam along compass bearing tracklines from 0 to 30 ft. and back toward the shore on a new bearing. We believe the area covered to be representative of the total area included in the survey request.

Visibility ranged from 5 to 10 ft. and it is reasonable to assume that the scientists were able to see sedentary animals as well as others not highly sensitive to diver presence. We do not know if mobile fish were present in the midwater areas which remained beyond the divers visible range.

Bottom composition throughout the area surveyed is very soft mud. The mud depth decreases as water depth increases and generally toward the east end of the area. Gravel and sand appear to be beneath the mud layer. The mud layer is heavily pocked with depressions, much like a landscape covered by saturation type bombing. Perhaps these holes are created by crayfish. Only one hole was observed to contain a crayfish.

Large boulders (football to wash tub size) are scattered about. They do not appear natural and were probably part of fill for the air field. Often the rocks are undercut with small caves for crayfish and 2-3 inch long bullheads.

There is a modest amount of man made discarded materials including bottles, cables, etc., and one piece that looks like part of an airplanewing. We found unexploded ordnance (50 cal. machine gun shell and larger) that might be of concern to a dredging crew. (See footnote  $l_{\bullet}$ )

Aquatic weeds grow sparcely in shallow water out to about 15 ft. A very small shrimp (1/2") is abundant near the bottom at all depths surveyed. Less than 15 crayfish were observed. A few small bullheads were seen lying beneath protective debris. One small spiryray fish was noted.

#### Footnote:

"The U. S. Naval Support Activity was notified about the reported submerged debris and suitable action was initiated to remove all material in the area. This program has been completed."

Petromyzontidae—Lampreys		
Entosphenus tridentata (Gairdner)	Pacific lamprey	L(T), S; R
Lampetra Ayresi (Gunther)	River lamprey	L(T), S; R
Lampetra richardsoni, Vladykov and Follett	Western brook lamprey	S; A
Salmonidae-Trout, Salmon, Whitefish	, ,	
Oncorhynchus gorbuscha (Walbaum)	Pink salmon	L(T); S(T); R**
Oncorhynchus keta (Walbaum)	Chum salmon	$S(T); R^{**}$
Oncorhynchus kisutch (Walbaum)	Coho salmon	L(T), S; A-C
Oncorhynchus nerka (Walbaum)	Sockeye salmon (migratory)	L, S(T); A
Oncorhynchus nerka (Walbaum)	Kokanee (Lacustrine)	L, S(T); C*
Oncorhynchus tshawytscha (Walbaum)	Chinook salmon	L(T), S(T); C
Prosopium williamsoni (Girard)	Mountain whitefish	L, S; C
Salmo clarkii clarkii Richardson	Coastal cutthroat trout	L, S; C
Salmo gairdneri Richardson	Steelhead trout (migratory)	L(T), S; C
Salmo gairdneri Richardson	Rainbow trout (resident)	L, S; C
Salvelinus fontinalis (Mitchill)	Brook trout	S; Unknown*(?)
Salvelinus malma (Walbaum)	Dolly Varden	L, S; C
Salvelinus namay cush (Walbaum)	Lake trout	L; Unknown* (?)
Prosopium coulteri (Eigenmann & Eigenmann)	Pygmy whitefish	L; C
Osmeridae—Smelts		
Spirinchus thaleichthys (Ayres)	Longfin smelt	L, S(T); C
Cyprinidae—Minnows		5
Cyprinus carpio Linnaeus	Carp	L; C*
Mylocheilus caurinus (Richardson)	Peamouth	L, S(T); A
Ptychocheilus oregonensis (Richardson)	Northern squawfish	L, S(T); A
Rhinichthys osculus (Girard)	Speckled dace	S; C
Richardsonius balteatus (Richardson)	Redside shiner	S; O
Tinca tinca (Linnaeus)	Tench	L; O*
Castostomidae-Suckers		
Catostomus machrocheilus Girard	Largescale sucker	L, S(T); C
Ictaluridae—Freshwater catfishes		
Ictalurus Nebulosus (LeSueur)	Brown bullhead	L; A*
Gasterosteidae-Sticklebacks		
Gasterosteus aculeatus Linnaeus	Threespine stickleback	L, S; C
Centrarchidae-Sunfishes	•	, ,
Lepomis gibbosus (Linnaeus)	Pumpkinseed	L; C - O*
Micropterus dolomieui Lacepede	Smallmouth bass	L; O*
Micropterus salmoides (Lacepede)	Largemouth bass	L; S(T); C*
Pomoxis nigromaculatus (LeSueur)	Black crappie	L; C*
Percidae-Perches	* 1	,
Perca flavescens (Mitchill)	Yellow perch	L; A*
Cottidae—Sculpins	renow peren	2,71
Cottus aleuticus Gilbert	Coastrange sculpin	L, S; C
Cottus asper Richardson	Prickly sculpin	L, S; A
Cottus confusus Bailey and Bond	Shorthead sculpin	S; C
Cottus gulosus (Girard)	Riffle sculpin	S; C
Cottus Rhotheus (Smith)	Torrent sculpin	S; C
Cottus sp.	Pelagic cottid	L; C
	-	

\*Introduced-has become established in the drainage

(?)Uncertain if species is present in the drainage

L=Residents of lakes L(T)=Transients in lakes S=Residents of streams S(T)=Transients in streams

A=Abundant C=Common O=Occasional R=Rare

Source: Wydoski, R. S., "Checklist of fishes occurring in the Lake Washington drainage," Intern. Rept. 34, Coniferous Forest Biome, University of Washington, AR-10, Seattle. (In press)

<sup>\*\*</sup>Doubtful occurrence of the species, except for an occasional fish

Species captured by Hansen (1970) in two-month gill-net study in Pontiac Bay.

SCIENTIFIC NAME	COMMON NAME
Oncorhynchus kisutch	Coho salmon
Oncorhynchus nerka	Sockeye salmon
Oncorhynchus nerka	Kokanee
Salmo clarkii clarkii	Coastal cutthroat trout
Salmo gairdneri	Steelhead (migratory)
Salmo gairdneri	Rainbow trout (resident)
Mylocheilus caurinus	Peamouth chub
Ptychotheilus oregonensis	Northern squawfish
Catostomus macrocheilus	Large scale sucker
Ictalurus nebulosus	Brown bullhead
Lepomis gibbosus	Pumpkin seed
Microplerus salmoides	Largemouth bass
Pomoxis nigromaculatus	Black crappie
Perca flavescens	Yellow perch
Cottus asper	Prickly sculpin

Source: Hansen, R. G. "Some fish species available from benthic gill net sets in Pontiac Bay, Lake Washington," Unpubl. Ms., College of Fisheries, University of Washington, Seattle, 1970.

	14	28	22	14	-	22	11	30	21	12	-	19	12	8	28	18	16	20
Phytoplankton	Jan	Jan	Feb	Mar	Apr	Apr	Мау	Мау	June	July	Aug	Aug	Sep	Oct	Oct	Nov	Dec	Jan
Chlorophyceae Pandorium morum Eudorina elegans																	-	
Sphaerocytis Schroeteri Ulothrix subconstricta																		
Pediastrum simplex duodenarium Pediastrum duplex							-											
Coelastrum microporum Dictyosphaerium pulchellum	-21															-		
Westella linearis ? Westella botryoides	- with				grafting.		1											
Oocytis Borgei Oocytis elliptica																		
Oocytis parva Nephrocytium limneticum																		
Ankistrodesmus falcatus Ankistrodesmus spiralis																		
Kirchneriella obesa Scenedesmus arcuatus			^ =	Alle														
Scenedesmus arcuatus capitatus Scenedesmus obliquus																		
Scenedesmus armatus Crucigenia rectangularis													_					
Spirogyra sp. Netrium digitus var.																		
Closterium Venus Closterium moniliferum	280		7. 1	40 liva		- Zu.	29%							-				
Closterium aciculare subpronum Closterium sp. cf. pronum			25.	e	7										7.			
Pleurotaenium trabecula Cosmarium depressum achondrum										137								
C. contractum ellipsoideum Staurastrum dejectum		J. San	Programa (Control of the Control of				-Ma-		25%		- 75	2.	M.		enti-		2	-
Staurastrum cuspidatum Staurastrum pseudopelagicum	13.	Jakon .	1215	Z				200	A-2-	-0	anditte							
Staurastrum paradoxum S. tetracerum trigonum	J.	X			ethis.	rokila.	.E	1000	.a.a.	#### #################################	al Corp.	20 m		-2-	and is	- s.	#2A	
Spondylosium planum Dinophyceae									A.						J.E.	T.		
Peridinium divergens Ceratium hirundinella					100 mm		2000	Approximation of the relation	2000 2000 2000 2000					T		600		
Euglenophyceae Phacus sp.																		

Source: Scheffer, Victor B., and Robinson, Rex J., "A Limnological Study of Lake Washington," <u>Ecological Monographs</u>, Vol. 9, No. 1, January, 1939, p. 117.

7 - 114	14	28	22	14	-	22	7	30	21	12	-	19	12	∞	28	18	16	20
Zooplankton	Jan	Jan	Feb	Mar	Apr	Apr	Мау	Мау	June	July	Aug	Aug	Sep	Oct	Oct	Nov	Dec	2
Protozoa		-											-					T
Tintinnus sp. Tintinnopsis sp.		_														i -		
Vorticella species "A" Vorticella species "B"								E.										- Andrews
Epistylis flavicans Epistylis sp.																		
Rotifera Collotheca mutabilis														-		FOY -Tuke		
Conochilus hippocrepis Conochilus unicornis													E.					
Synchaeta stylata Filinia longiseta																		
Polyarthra euryptera Diurella rousseleti							181						-		4120			
Trichocerca cylindrica Lepadella acuminata																		
Brachionus calyciflorus Keratella quadrata	alcala.	- 24		_	-													
Keratella cochlearis Notholca striata																wed-day-ox	n ne Ping	
Notholca striata acuminata Notholca longispina	*								-					and the second				
Ploesoma hudsoni Ploesoma truncatum									\$°									
<b>Crustacea</b> Diaphanosoma leuchtenbg'm	<u> </u>					. inte	rida		operation of			WIND BARRE	33%		Taranta and	3=		
Daphnia pulex Daphnia longispina		antin	at the					- ST					bs. Cyrone			198		
Bosmia longispina Leptodora kindtii							*	E the	200	, artin.	Z.		70,07			20	5 0	-
Epischura nevadensis Diaptomus ashlandi	200	- 20	77			*		II.	3.	I		1350 241	M					Total Section
Cyclops viridis Cyclops bicuspidatus	-		- T		772		10000									333		100
Canthocamptus staphylinoides Copepod nauplii	21			75	ATTRACTOR OF THE PARTY OF THE P	The state of the s		<b>E</b>		200	27.54		1413	715	70.5		3-2	
Pontoporeia filicornis Neomysis mercedis	al. No.									-	33		5000			5750		

Source: Scheffer, Victor B., and Robinson, Rex J., "A Limnological Study of Lake Washington," <u>Ecological Monographs</u>, Vol. 9, No. 1, January, 1939, p. 116.

- 1. Allisma plantago-aquatica L.-Water Plantain
- 2. Elodea canadensis (Michx.) Planch.—Waterweed
- 3. Azolla sp.
- 4. Callitriche palustris L.—Water Starwort
- 5. Ceratophyllum demersum L.-Hornwort
- 6. Hippuris vulgaris L.—Marestail
- 7. Lemna minor L.-Duckmeat
- 8. Lemna trisulca L.-Fairy Paddle
- 9. Naias flexilis (Willd.) R. & S.-Slender Naias
- 10. Nuphar polysepalum Engelm—Yellow Pond Lily
- 11. Potamogeton natans L.-Floating Brownleaf
- 15. Potamogeton richardsonii (Benn.) Rydb.-Richardson's Pondweed
- 16. Sagittaria latifolia Willd.—Wappato
- 17. Scirpus microcarpus Presl.—Small-fruited Bullrush

13. Potamogeton pectinatus L.-Sago Pondweed 14. Potamogeton pusillus L.—Small Pondweed

12. Potamogeton nuttallii C. & S.-Nutall's Pondweed

- 18. Scirpus occidentalis (Wats.) Chase—Western Tule
- 19. Sparganium greenei Morong-Branch-stemmed Bur Reed
- 20. Typha latifolia L.—Cat-tail
- 21. Vallisneria spiralis L.-Wild Celery (introduced)

Source: Scheffer, Victor B. and Robinson Rex J., "A Limnological Study of Lake Washington," Ecological Monographs, Vol. 9, No. 1, January 1939.

#### EXHIBIT P. Shoreline Vegetation of the Lake Washington Environs

(1) Equipment to be employed on the site shall not produce a noise level exceeding the following limits in dBA at a distance of 50 feet from the equipment under test.

	Effec	tive Dates		Effective Dates		
Equipment	July 1, 1972	January 1, 1975	Equipment	July 1, 1972	January 1, 1975	
EARTHMOVING			STATIONARY			
Front Loader	79	75	Pumps	76	75	
Backhoes	85	75	Generators	78	75	
Dozers	80	75	Compressors	81	75	
Tractors	80	75	·			
Scrapers	88	80	IMPACT			
Graders	85	75	Pile Drivers	101	95	
Truck	91	75	Jack Hammers	88	75	
Paver	89	80	Rock Drills	98	80	
MATERIALS HANDLING			Pneumatic Tools	86	80	
Concrete Mixer	85	75				
Concrete Pump	82	85	OTHER			
Crane	83	75	Saws	78	75	
Derrick	88	75	Vibrator	76	75	

(2) The Contractor shall comply with all applicable state and local laws, ordinances, and regulations relative to noise control.

(3) Stationary equipment may be provided with acoustic enclosures to provide the required sound attenuation subject to continued maintenance of such enclosures to assure that maximum sound levels specified are not exceeded.

(4) Where field sound measurements reveal sound levels exceeding those listed above, Contractor shall cease operating such equipment and repair or replace it with equipment complying with these sound levels.

### EXHIBIT Q. GSA Construction Noise Standards

#### SOCIO-ECONOMIC DATA

VARIABLE	KING COUNTY	CITY OF SEATTLE	SAND POINT AREA*	
Population 1960	935,041	557,087	31,254	
1970	1,159,375	530,831	30,258	
1990 (projection)	n/a	534,000	30,700	
Percent non-white	6.9%	12.6%	2.7%	
Families below poverty level	5.0%	6.0%	2.7%	
Families receiving social security	7.0%	24.0%	4.7%	
High school drop-outs	9.2%	9.2%	2.8%	
65 years & over	8.8%	13.1%	10.4%	
Average income	\$13,359	\$12,557	\$18,037	
Average Housing value**	\$19,100	\$17,700	See below	
Average contract rent	\$97	\$95	See below	
Housing built before 1940	31.2%	47.6%	22.4%	
Housing vacancy rate, 1970	7.4%	7.0%	3.0%	
Two car households	41.2%	29.4%	46.7%	
Same residence, 1965		48.4%	57.5%	

<sup>\*</sup>Census tracts 22, 24, 39, 40, 41, 42; data derived from aggregation of tract data.

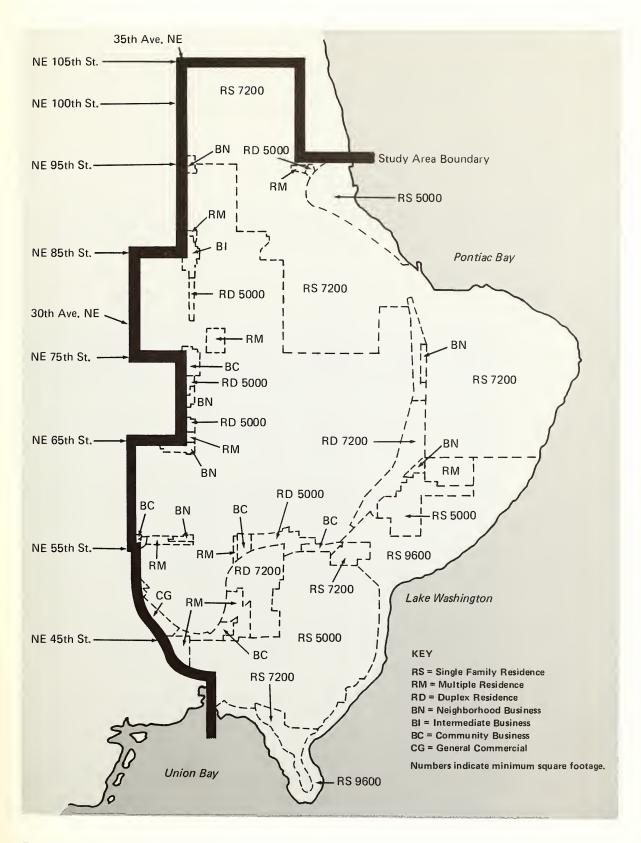
Sources: U.S. Census of Population, City of Seattle Office of Community Development and King County Planning Department.

### SELECTED CHARACTERISTICS FOR SIX SAND POINT AREA CENSUS TRACTS \*

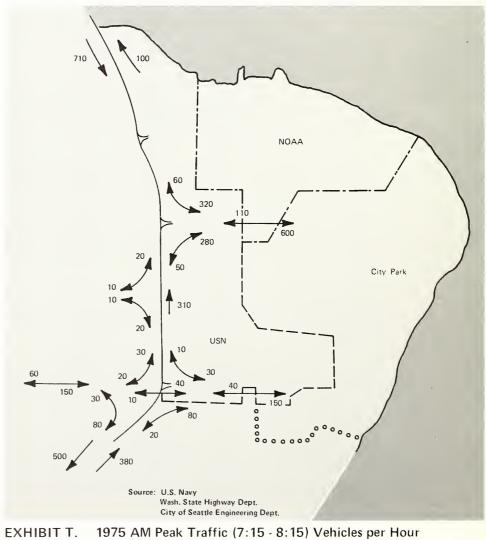
VARIABLE	#22	#24	# 39	# 40	# 41	#42
Population 1960	4849	4370	3416	1885	8732	8002
1970	5863	3129	3428	1853	8370	7615
1990 (projection)	6163	3013	3196	1621	8784	7930
Median Age	30.3	29.8	31.1	35.6	31.1	34.9
Median School Years	13.25	12.9	13.05	17.0	17.0	13.02
Median Income	\$15,600	\$12,600	\$15,400	\$17,400	\$18,400	\$12,800
Median Housing Value	\$31,200	\$21,500	\$26,700	\$31,000	\$38,300	\$21,900
Median Rent	\$123	\$124	\$127	\$151	\$107	\$125
Percent Below Poverty Level	2.5%	4.4%	2.2%	2.4%	1.6%	3.4%
Percent Receiving Social Security	5.2%	6.5%	6.2%	7.2%	6.7%	10.1%
Housing Vacancy Rate	2.5%	1.0%	1.8%	15.4%	2.0%	2.6%
Housing Built Before 1940	7.1%	6.4%	6.7%	5.5%	34.0%	39.0%
Two-car Households	58.4%	37.3%	50.7%	63.4%	52.7%	36.5%

<sup>\*</sup>Tracts correspond to map, Figure 18.

<sup>\*\*</sup>Owner-occupied units.



**EXHIBIT S.** Sand Point Area Zoning



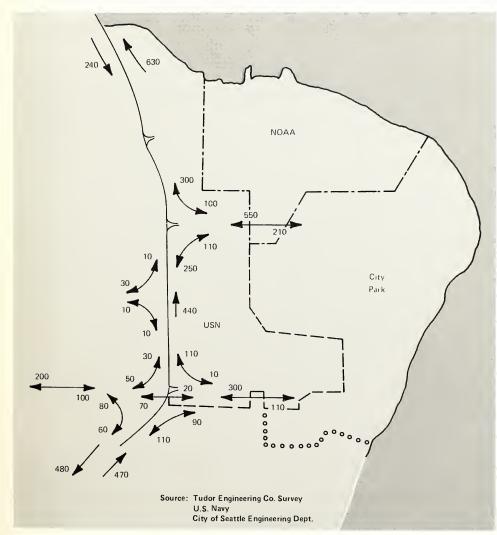


EXHIBIT T. 1975 PM Peak Traffic (3:45 - 4:45) Vehicles per Hour





